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ON THE
PREHISTORIC BRITISH *SUS*.

BY

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(Abstract.)

THIS memoir will be printed in the Society's Transactions in full.

The following specimens were exhibited at the Meeting :—1. Skull of *S. scrofa*, var. *domesticus*, from a late Celtic interment. 2. Skulls of *S. scrofa*, var. *ferus*, from alluvium near Oxford and from Germany. 3. Skull of *S. andamanensis*, forwarded to the Author by J. Wood Mason. 4. Skull of *S. cristatus*, lent by Sir Walter Elliot, K.C.S.I. 5. Skull of *S. barbatus*, wrongfully named *S. verrucosus*, and needlessly *Euhys barbatus* in some mammalogical catalogues.

Upon these and other data the author bases the subjoined conclusions :—

1. The domesticated pig of pre-Roman times, at least as exemplified by the specimens from the interment referred to, appears to resemble *S. scrofa*, var. *ferus*, rather than *S. cristatus* or the domestic variety, *S. indicus*.

2. On the other hand, *S. cristatus*, the Indian wild hog, appears to him, whilst being readily and always distinguishable from *S. scrofa*, var. *ferus*, to differ from it mainly by the retention permanently of certain structural conformations which were only temporarily represented in the European wild species. The third molars of the male *S. cristatus* varied, however, concomitantly with its canines, and showed a much larger development of their posterior lobe than either *S. scrofa*, var. *ferus*, or the females of their own species. The rearmost lobe, however, of the posterior

molar varies a good deal in *S. scrofa*, var. *ferus*, irrespective of sex.

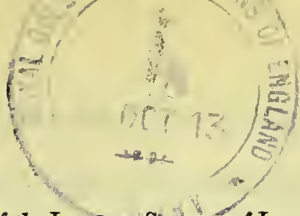
3. Bearing in mind the elasticity of the swine type and the power for changing which their domestication has shown them to possess, Dr. Rolleston has less difficulty in conceiving that the so-called *S. indicus* was really a modified *S. cristatus*, than that it had been evolved from any *Sus* (such as *S. leucomystax*) from countries further away from Europe than India. *S. cristatus* had the malar border of the lachrymal always marked by the relative shortness insisted on by Nathusius. It had not the relatively wider palate; but upon this point too much weight had been laid.

4. A skull of a wild sow from the alluvium, later in date than the "river-gravel," near Oxford, combined the short lachrymal characteristic of young pigs and of *S. cristatus* with the worn-down teeth, elongated facial skeleton, and disproportionately small size of an old wild sow (*S. scrofa*, var. *ferus*). Such a combination of characteristics tended to suggest carefulness as to accepting the Torf-Schwein (*S. scrofa*, var. *palustris*) of Rütimeyer as a distinct species, or taking even such a point as the shortness of the lachrymal as constituting a specific difference.

5. The simplicity of the third molars in the very large skull of *S. barbatus* appears to be of greater value, as the rugose condition might have been expected to be forthcoming in so large, so well-armed, and so well-fed a *Sus* as this from Borneo.

6. The 'rue *S. verrucosus* differs from *S. barbatus* in having the lachrymal's malar edges long, relatively to its orbital, as well as in the peculiarities which its specific name implies. These peculiarities were reproduced in the old Irish "Greyhound Pig," figured by Richardson, 'Domestic Pigs,' p. 49, ed. Warne.

7. The often quoted paper by Dr. Gordon, 'Medical Times and Gazette,' May 2, 1857, p. 429, led us to suppose that *Tænia solium* of man infested the domestic pig of India as it does those of other parts of the world. The facility with which the pig lends itself to domestication enables us to understand how the many-sided commensalism which now exists between man and that animal may have set up in very early times. Indeed the particular result of their commensalism which their solidarity as regards the alternations of the generations of *Tænia solium* represents, suggests that their coexistence in time must have been more extensive than even the coexistence in space ascribed to them, not quite correctly, by Gibbon ('Decline and Fall,' chap. ix. note 9, p. 392, Smith's edition).



[Extracted from the 'TRANSACTIONS of the LINNEAN SOCIETY of LONDON,' Second Series,—ZOOLOGY, vol. i.]

XIII. *On the Domestic Pig of Prehistoric Times in Britain, and on the mutual Relations of this variety of Pig and* *Sus scrofa ferus*, *Sus cristatus*, *Sus andamanensis*, and *Sus barbatus*. By GEORGE ROLLESTON, M.D., F.R.S., F.L.S., Linacre Professor of Anatomy and Physiology, Oxford.

(Plates XLI.—XLIII.)

Read June 15th, 1876.

PORTIONS of two skeletons of domestic pigs having been put into my hands by the Rev. William Greenwell, F.S.A., from an interment of the so-called late Celtic period, *i. e.* of the ultimate or penultimate century before the Roman conquest of this country. I determined to compare them with such other specimens of *Suidæ* as might by any possibility be genetically connected with them. Among these other specimens I may mention, first, several specimens of the Wild Boar, *Sus scrofa*, var. *ferus*, from the alluvial deposits of this neighbourhood, and now in the Geological Series of the Oxford Museum, under the charge of Professor Prestwich, F.R.S.; secondly, five specimens of the Indian Wild Hog, *Sus cristatus*, kindly lent me by Sir Walter Elliot, K.C.S.I., F.L.S.; thirdly, two skulls of *Sus andamanensis*, presented to the Oxford University Museum by my friend Prof. J. Wood-Mason, of the Indian Museum, Calcutta; and fourthly, four skulls of *Sus barbatus* from Borneo. The extensive series of skulls of *Suidæ* contained in the British Museum, those in the Royal College of Surgeons of London, and the specimens of wild- and domestic-swine skulls contained in our own collection were also used for this comparison.

It may be well at the outset to specify the several points of wide and general interest upon which such an inquiry as the ensuing may be brought to bear. First among these I would mention its bearings upon the now so commonly discussed questions relating to the early migrations of our own species. The pig was one of the earliest, possibly the very earliest, of animals which man domesticated; and the question of the source or sources whence it was derived has consequently an "ethnographisch-archæologische Bedeutung" (to use the words of Fischer*, in his analogous investigation as to the sources whence the jade and nephrite of early European times were procured) of the first importance. Gibbon† has remarked that "man is the only animal which can live and multiply in every country from the equator to the poles;" and he has proceeded to aver that "the hog seems to approach nearest to our species in that privilege." As a matter of fact, Gibbon here, as so often elsewhere, was very nearly though not quite exact: the northward limit of the range of the Wild Boar may perhaps be taken as somewhere between

* H. Fischer, 'Nephrit und Jadeit nach ihren mineralogischen Eigenschaften.' Stuttgart, 1875. For similar investigations as to the sources of the cultivated plants and the weeds of prehistoric times, see Keller's 'Lake-Dwellings,' translated by Lee, pp. 303 and 343.

† 'Decline and Fall of the Roman Empire,' chap. ix. note 9, p. 352. Smith's edition.

55°* and 60° N., and that of the tame Pig as 64° N., whilst that of the Common Fowl† extends probably a little, and that of the Dog certainly much, further northward. The mention of the Australian Dingo suggests another amendment of the somewhat cynical remark of our great historian.

Secondly, a very useful light is thrown, or may be thrown, upon the question of the extent to which the influences of civilization act upon our own species, by the analogous inquiry into the effects which domestication has been able to produce upon an animal linked so closely with ourselves in a many-sided commensalism. The least pleasant aspect of that commensalism, that, namely, which is presented to us by the facts of our solidarity with swine in the maintenance of the alternation of the forms of life of *Tænia* and *Trichina*, must, it may be remarked, upon any view of the origination of the four species concerned, force upon our attention considerations of the very greatest gravity. To take somewhat lower ground, from such a study as that of the variations of the Pig under domestication, we may obtain safe criteria for estimating the relative effects of food, whether scanty or abundant, of early or late exercise of the sexual functions, and of intercrossing, upon the formation of facial characteristics. The importance of not overlooking the influences of sex and of age is nowhere more forcibly pressed upon our attention than in an examination of a series of skulls of *Suidæ*. It has often been overlooked in disquisitions on the skulls of *Hominidæ*.

Thirdly, whether the question at issue as regards man between the Polygenists and the Monogenists will, as has been predicted (Darwin, 'Descent of Man,' ed. 2nd, p. 180, 1874), "die a silent and unobserved death" or not, there can be no doubt that illustrations of the argumentations whereby that question has been, or ought to have been, dealt with, can be furnished nowhere more fitly and fully than in an inquiry into the distinctness or non-distinctness of the various races of swine.

Three distinct views have been advocated as to the relationship of the domestic to the wild swine, *Sus scrofa*, var. *ferus*. We may take as the first of these that advocated by Professor Steenstrup‡, and stated by him in the following plain words:—"Il n'y a pas de transition à observer entre les sangliers et les plus anciens cochons domestiques."

In this view Professor Steenstrup will find Mr. Samuel Sidney coincide in the opening sentences of his work 'On the Pig;' and a view very closely similar to it was put tentatively forward in the year 1821 by a *savant* who combined the functions of a Professor of Materia Medica with those of Director of the Botanical Garden at Berlin, Professor Link, in the following words, to be found in his work 'Die Urwelt und das Alterthum,' i. p. 192.

"Das zahme Schwein stammt nach allen Naturforschern von den wilden Schweinen ab, und auch die Alten waren schon dieser Meinung §; doch scheint mir die Sache

* For the northward range of the Wild Boar and the tame Pig, see Brandt und Ratzeburg, *Med. Zool.* p. 89; Fitzinger, *Sitzungsberichte d. Acad. d. Wiss. Wien*, 1864, p. 387; Radde, *Reise im Süden von Ostsibirien*, i. 236; Zimmermann, *Geographische Geschichte*, i. 189, 1778. Middendorff, in his 'Sibirische Reise,' p. 1062, 1867, gives 56° N. lat. as the extreme actual northward limit of the Wild Boar. (Since I wrote as above, Mr. H. N. Moseley has procured for me a skull of a tame pig from Stene i Bö, Lofoten Islands, 2° above the arctic circle.)

† For the northward range of the domestic Fowl, *Gallus domesticus*, see Brandt and Ratzeburg, *l. c.* p. 150.

‡ Bulletin du Congrès International d'Archéologie préhistorique à Copenhague en 1869, p. 163.

§ Varro, 'De Re rustica,' l. ii. c. 1.

keinesweges entschieden. Die Stärke, Grösse und Farbe des wilden Schweines würden keinen Unterschied machen, da die wilden Thiere stärker, grösser, und dunkler gefärbt sind, als die zahmen, aber die grossen Hauer des wilden Ebers scheinen doch nicht bloss Vergrösserung zu sein. Die Feltdecke des zahmen Schweines findet sie niemals auch bei dem fettesten wilden Schweine, die gestreifte Farbe des Frischlings ist sogar merkwürdig, die Stirn der wilden Schweine ist mehr gewölbt, die Ohren sind kürzer, mehr zugerundet, der Rüssel länger, andere Verhältnisse an den innern Theilen zu geschweigen. Es fehlt ganz an Beispielen, dass die Zähmung solche Veränderungen hervorgebracht. Vielleicht stammt das zahme Schwein von einer orientalischen Art ab, welche gross aber unschädlich sein soll, und hin und wieder in einigen Reisebeschreibungen erwähnt wird *. Doch erfordert die Sache noch eine genauere Untersuchung. Das siamische Schwein aus dem östlichen Asien abstammend, ist ohne Zweifel eine besondere Art."

Precisely the opposite view was held by Mr. Youatt, who at p. 35 of his work on "The Pig," London, 1847, says, when speaking of the Wild Boar, "no one can for a moment doubt that it is the parent stock from which the domesticated breeds of swine originally sprang." Blasius (Säugethiere, 1857, p. 509), Fr. Cuvier (Hist. des Mamm., 1824), and Giebel (Säugethiere, p. 225, 1859), would I apprehend, agree with the extreme view enunciated by Mr. Youatt. An intermediate view is put forward by Rütimeyer in his inestimable work, 'Die Fauna der Pfahlbauten,' pp. 186-190: according to him, what, owing to the slow spread in Germany of improved breeds, may still be called *das gemeine Hausschwein*, has originated from *Sus scrofa*, var. *ferus*; whilst the Berkshire breeds, he thinks, may owe their origin to *Sus celebensis*; and his *Sus scrofa*, var. *palustris*, "das Torfschwein," a domestic pig known as "das Bündtner Schwein," and *Sus indicus* may represent a distinct stock, if not species. Nathusius, in his 'Schweineschädel,' p. 175, agrees with Rütimeyer as to the origin of the large-eared race common in Central Europe, but suggests *Sus vittatus*, of the islands of Java, Borneo, Amboyna, and Batchian, as the parent stock of the widely spread domestic breed known as *Sus indicus*. In this latter point he agrees with S. Müller. Fitzinger (*l. c.*) differs from Nathusius in supposing, without, perhaps, adequate reasons, *Sus leucomystax* to be the parent stock of the Chinese, Cape, Portuguese, and Cleveland breeds, whilst *Sus cristatus*, the Wild Pig of Hindostan, he suggests as the parent stock of the Siamese and Sardinian races. Temminck ('Fauna Japonica,' p. 57, pl. xx., *cit.* Nathusius, *l. c.* p. 167) suggests that *Sus leucomystax* may be the parent of the domestic *Sus indicus*; and though Nathusius, p. 167, demurs to the enunciation of this statement as being definitely proved, his objection amounts to little more than saying that *Sus leucomystax* is probably not specifically distinct from *Sus vittatus*, which Nathusius himself holds to be the parent stock of *Sus indicus*.

My own views, as based upon the data available to me, are to the following effect:—The prehistoric domestic swine which have come into my hands appear to me to be more nearly affined to *Sus scrofa* than to any of the Asiatic wild swine with which I am acquainted; secondly, without wishing to affirm absolutely that too much weight has been laid by Nathusius upon the shortness of the lacrymal for differentiating *Sus indicus*, as we now see it, from *Sus scrofa* and its progeny, I am inclined to think that sub-

* Otter, Voyage en Persie, t. i. p. 207. D. Maillet, Description de l'Egypte, t. ii. p. 176.

equality, if not actual equality, between the malar and the orbital borders of the lacrymal bone may be found in prehistoric skulls of the *Sus scrofa*, var. *ferus*, and especially in the female skulls of that variety of *Sus* which, in other points, such as the slenderness of the snout, differ from the "Torfschwein," the representative in those times of *Sus indicus*, according to Rütimeyer; and, thirdly, I think it is possible to show that, whilst *Sus cristatus*, *Sus leucomystax*, *Sus vittatus*, and *Sus timorensis* form a closely connected group of *Suidæ non verrucosi*, with which, again, *Sus andamanensis* and *Sus papuensis* are to be allied, all these subspecies differ in points of considerable if not of specific value from *Sus verrucosus* of Java, from *Sus celebensis*, and, finally, from *Sus scrofa* of the Palæarctic region as well as from the non-verrucose *Sus barbatus* of Borneo.

It may be well to begin with this latter point first, and to show that the group of Eastern Pigs, of which the Wild Pig of India, the Malay peninsula, and the Lencay Islands, *Sus cristatus*, may be taken as a type, is always distinguishable from *Sus scrofa*, var. *ferus*, of Europe, and Asia north of the Himalayas. This view is not equivalent to one which should lay it down as certain that they are specifically distinct, a question which it is not proposed to raise here. I should agree, however, with Mr. Jerdon, whose book on the Mammals of India, 1874, came into my hands subsequently to the formation of my opinion, in holding that the Indian Wild Hog was "as worthy of specific distinction as many other recognized species" (*l. c.* p. 241), though this is not to say much. I should not, however, entirely accept his statement to the effect that the head of the Indian Wild Hog was longer and more pointed than that of the European Wild Boar, though this has been laid down by Colonel Sykes (*Proc. Zool. Soc.* 1831, p. 30) as being the state of the case; for in measuring the relative lengths of the nasal and fronto-parietal regions of the Indian Wild Hog, I have come to think that precisely the reverse of this statement is usually, though not invariably, the case, the Indian Hog having the nasal bones shorter relatively to the rest of the roof-bones of the skull than *Sus scrofa*, var. *ferus*. Neither do I agree with Colonel Sykes in holding that the straightness of the plane of the forehead will differentiate the Indian at least from modern European Wild Boars: some concavity is produced in the mesial contour-line of large Prehistoric Wild Boars, not by any angulation at the junction of the facial with the cranial bones, as in modern tame swine of highly cultivated breeds, but by the upgrowth of the back portion of the skull roof-bones and the occipital transverse crest; modern European Wild Boars, however, which are much inferior in size to their prehistoric and, indeed, to their mediæval predecessors, have the fronto-parietal and nasal lines forming one unbroken straight line.

Colonel Sykes's words, "Tail never curled or spirally twisted," appear to me (*l. c.* p. 11) to be said of the tame variety of the Indian Hog; but though Fitzinger (*Sitzungsbericht. Akad. Wiss. Wien*, 1864) specifies the form in which the caudal vertebræ are carried as one of the specific marks in each of his descriptions of the *Suidæ*, and though Linnæus uses the words (*Ed. xiii. Syst. Nat.* p. 65) "*Cauda sinistrorsum recurvata*" for differentiating *Canis familiaris* from *Canis lupus*, s. *Canis cauda incurvata*, I am inclined to think too much weight may be laid upon this point.

Thoroughly trustworthy figures of the European Wild Boar, such as that given by Schreber (*Säugethiere*, taf. cccxx.), or that in Buffon's *Hist. Nat.* v. pl. xiv., and Fréd.

Cuvier, Hist. Mamm., represent it as having the root and tip of its tail lying evenly between two points; though the Vienna zoologist just referred to says of this appendage in this animal, "Schwanz geringelt, kurz, nicht ganz bis zum Fersengelenke reichend." And as an indication of the trifling value of such a point as this, it may be remarked that of two female specimens of the very well-marked species, *Sus barbatus*, one young, the other old, figured by S. Müller, Verhand. i. taf. 30, one has the tail curled, and the other, the elder one, has it straight.

Mr. Blyth (*cit.* Jerdon, *l. c.*) holds *S. cristatus* to be only a variety of the Wild Boar of Europe, but still to be a well-marked race. De Blainville (*Ostéog. Sus*, p. 129) sees no differences of morphological importance between any of the Asiatic Swine and the European Wild Boar, and says, "La première espèce que le squelette nous permette de distinguer par des caractères susceptibles d'être lus et exposés est celle qui se trouve dans toute l'Afrique au delà de l'Atlas et jusqu'à son extrémité la plus méridionale et même au delà dans la grande île de Madagascar, et qui est connue sous le nom de *Sus larvatus*" (*Potamochoærus africanus*, *Porcus madagascariensis*, nobis). Giebel follows De Blainville in this. Dr. Gray, in Proc. Zool. Soc. 1852, p. 130, said that, after examining ten skulls of the European Wild Boar and its offspring from this country, from the Gambia, and from the Cape, as also twelve skulls of the Wild Hog from Continental India, he could not discover any constant easily described character by which the European and the Indian kinds could be distinguished. And, he adds, "this is the case in the many other genera allied to the Pigs." It is true, no doubt, that many animals, such as "the lion and the tiger, the fox and the jackal, the ass and the zebra, are far more strikingly differentiated by their pelage than by their skulls," as Professor Huxley ('Prehistoric Remains of Caithness,' p. 132) has taught us; still it yet remains to be proved that differences which, though only skin-deep, are constant and permanent, will not ultimately be found to be correlated with more or fewer differences of the deeper-lying parts, either of a purely qualitative or of a quantitative kind.

In a disquisition the ultimate object of which is the attainment of clearer views as to the origin of our tame pigs, the question meets us at the outset whether there exists any marked difference between the wild stocks under comparison as regards their susceptibility of domestication. Upon this point I have to say that I find, in opposition to what Mr. Samuel Sidney has laid down in the first chapter of his work on the Pig, that *Sus scrofa*, var. *ferus*, is credited by most trustworthy authors with as great a capacity for domestication as any wild animal, including its wild Asiatic congeners, upon which observations are recorded as to this particular susceptibility. Pallas's words in his 'Zoographia,' i. p. 269, as to the Wild Boar of the Palæarctic Region, called by him, not inconveniently, *Sus europæus*, in contradistinction to the China or Siam Pig, called by him *Sus indicus*, says plainly and emphatically "Porcelli cicurari assuescunt facile et cum domesticis generant." Radde's utterances (*Reisen im Süden von Ost-Sibirien*, Bd. i. p. 236) are even more to the point, as they affirm the like of wild swine of greater age. They run thus "So muss ich gestehen dass sie sehr friedlicher Natur sind, und es mir mehrmals passirte mittelalte Wildschweine sich mir bis auf vier Faden Weite nahen zu sehen."

The Asiatic pigs, secondly, of the group represented by *Sus cristatus*, though not, within my knowledge, those known as *Sus verrucosus*, nor those known as *Sus barbatus*, have very similar and very numerous testimonies borne to their educability and capacity for attachment to man. Fitzinger, indeed, says of the domesticated Chinese Pig, his "*Sus leucomystax sinensis*," that it resembles the domesticated European Pig generally in its habits and character, but that it shows much more attachment than the European farm-pig to the persons who take care of it, and will even follow them about, although it is otherwise troublesome and obstinate. (Sitzungsberichte d. Akad. Wiss. Wien, 1858, Bd. xxx. p. 235). In Formosa, when the Dutch first became acquainted with it, in the beginning of the 17th century, every native woman, we are informed, on the authority of Ogilby (Atlas Chinensis, ii. p. 8, *cit.* by Swinhoe Proc. Zool. 1870, p. 643), had "a great pig running after her, as we use to have a dog." A closer intimacy than this has been observed to exist between *Homo sapiens asiaticus*, Linn., and *Sus sinensis*, Linn., by Professor Huxley (*cit.* Galton, Trans. Ethnol. Soc. vol. iii. 1865, p. 127), who has seen sucking-pigs nursed at the breasts of women, apparently as pets, in islands of the New-Guinea group. As regards the wild races, Sir Walter Elliot tells me, in a letter of date May 15, 1876,—“I have seen the young of *Sus cristatus*, which had been captured by some of the Indian nomad communities, and reared by them, running about among the domestic stock; so that it would be hard to say where the line should be drawn”*. The wild *Sus papuensis* has been found by Europeans, as we are informed by M. R. P. Lesson (Voyage de la Coquille, 1826, vol. i. p. 176), to be more thoroughly domesticable than the half-wild state in which some of the natives are content to leave it would have led us to expect, and to set up relations of mutual amity, not only with the human, but also with canine companions.

As regards the Æthiopian region, the Wild Hog is reported to us by Dr. Barth † as consorting on terms of perfect amity, and, indeed, intimacy, with other domesticated animals than the dog, and also with the natives. These are his words relating to a district in Central Africa:—“Naked young lads were splashing and playing about in the water together with wild hogs in the greatest harmony; never in any part of Negroland have I seen this animal in such numbers as here about the Shári. Calves and goats were pasturing in the fields with wild hogs in the midst of them.”

It is impossible to be perfectly certain what wild hog this may have been; still it can scarcely have been any other than *Sus sennaariensis*, which has been supposed (see Darwin, ‘Domestication,’ i. p. 71, 2nd ed.) by J. W. Schütz to have been the parent stock of *Sus scrofa*, var. *palustris*, of Rütimeyer, but underneath the entry of which, in the British-Museum Catalogue of 1869, p. 338, I find the following note:—“Dr. Murie says he has often seen and eaten the true Wild Boar of the genus *Sus* in Africa, as well as the *Potamochoerus*, on the west coast. I have never seen any, or the skull of one.” Like Dr. Gray, I have had no quite satisfactory opportunities for forming an

* It would appear that this difficulty has been felt by others to be a very real one. Colonel Walter Campbell tells us, at p. 325 of his ‘Indian Journal,’ 1864, that he fears “the young gentlemen of the present day have taken to spearing village pigs instead of wild boars,” and that he has “seen the thing done before now.”

† Referred to by Nathusius, p. 147, *l. c.*; or see his ‘Travels in Central Africa,’ vol. iii. p. 311, 1857.

opinion, such as inspection of authentic skulls gives, as to the relations of *Sus sennaariensis* to *Sus scrofa*; but whilst going over the series of skulls of Suidæ in the British Museum, I came upon one which, though entered under the head of *Potamochoerus africanus*, ought, I make no doubt, to be entered under the head of *Sus sennaariensis*, or, as I should prefer to call it, *Sus scrofa*, var. *africanus*. This skull is numbered 715 a; and of it we have the following history from Dr. Gray (Proc. Zool. Soc. 1868, p. 35; Brit. Mus. Catalogue, 1869, p. 342):—"A skull without its lower jaw (715 a) was brought home by Captain Alexander from his Expedition to Damara, and presented to the British Museum. It is recorded in Mr. Gerrard's 'Catalogue of the Bones in the British Museum' as *Sus capensis* (p. 277). It is the skull of an adult animal, with the crown of the grinders much worn. It is probably the skull of a female, as it agrees with all the characters of *Potamochoerus*; but it has only a well-marked ridge across the upper part of the base of the sheath of the upper canine, and the upper margin of the nose is not dilated nor swollen." When I took this skull into my hands I was uncharitable enough to suggest to Mr. Gerrard that it was a skull of *Sus cristatus* wrongfully assigned to Damara as its *habitat*. Leaving this low ground, I came to think that it might have come from some descendant of pigs of the *Sus indicus* breed which had run wild at the Cape and reverted to the *Sus cristatus* form. But I have now no doubt that this is a skull of such a Wild Boar as those of which Dr. Murie speaks; and if this be so, the *Sus* of Africa is not readily to be distinguished from *Sus cristatus*, at least by cranial characters. Dr. Gray, under the heading *Sus sennaariensis* (Proc. Zool. Soc. t. c. p. 32, and British Mus. Catalogue, 1869, p. 338), suggests that the skull figured by De Blainville (Ostéographie, tab. v.) may have belonged to a *Sus sennaariensis*. It is described as "*Sus scrofa ægypti*" by De Blainville; but, as far as I can judge from the drawing, it has all the characters, to be hereinafter detailed, which distinguish *Sus scrofa*, var. *ferus*, from *Sus cristatus*, and consequently from such a skull as that labelled 715 a, and brought home by Captain Alexander. Of course there is no *à priori* difficulty in the way of our supposing that the Wild Boar either of Palestine or of Algiers, both well-known animals, may have extended into Egypt, a country which has so much both of the Palæarctic and of the Æthiopian fauna in occupation of its territory. Anyhow Dr. Murie and Dr. Barth are sufficient witnesses to the fact that a true *Sus* is found in Africa south of the Atlas and Sahara. I cannot, therefore, accept Mr. Wallace's statement ('Geograph. Distrib. of Animals,' vol. i. pp. 253, 286-322) to the effect that a true *Sus* is not to be found in the Æthiopian region. The mistake made, and handsomely acknowledged, by Fitzinger (Sitz. Akad. Wiss. Wien, 1864, Bd. 49, i. p. 389), in naming certain young specimens of *Sus sennaariensis* by the name which Fr. Cuvier had given to the Masked Boar, supposing them to be the young of that species, would not have occurred with adult specimens. What Fr. Cuvier called *Sus larvatus*, we know as *Potamochoerus africanus*; to save further confusion of names and errors of fact, it would be well to drop the name *Sus larvatus* altogether. *Potamochoerus*, which I observed to resemble *Sus cristatus* in having a large lacrymo-frontal ridge, is, of course, specifically distinct from it. *Sus sennaariensis*, if, as I think is most likely, closely allied to *Sus cristatus*, is another instance of the wide distribution of "Pachyderms," a

point on which Rüttimeyer insists, in a different tone (*Herkunft unserer Thierwelt*, p. 34) from that adopted by Gibbon, but not less categorically, nor, indeed, less strikingly, remarking, as he does, that at the present day the *Hyrax* and the *Hippopotamus* are the only genera of "Pachyderms" confined to one quarter of the globe.

The Æthiopian region therefore must be held to possess a true *Sus*; and as to domesticability, the Palæarctic, the Oriental, and the Æthiopian Suidæ have possibly equal claims*.

There would be little weight to be laid upon mere differences in size, even if much greater differences did exist between *Sus scrofa*, var. *ferus*, and *Sus cristatus* than a comparison of the measurements given in the British-Museum 'Catalogue of Carnivorous Pachydermatous and Edentate Mammalia,' 1869, pp. 334, 337, 338, or a comparison of the skulls themselves shows to be the case; for Pallas's† words and Nathusius's‡ are both clear to the effect that differences of as much as 50 per cent. do exist between individuals of the *Sus scrofa*, var. *ferus*; and a comparison of what I believe to be the skull of an old Wild Sow, from the alluvium of the Thames, near Oxford (Pl. XLI. fig. 2), with that of a modern Wild Boar (Pl. XLII. fig. 5), will put the matter beyond all question.

According to Nathusius‡, the differences in size between the largest and the smallest wild swine are so considerable as to have caused them to be distinguished by such names

* Pigs fulfil excellently well the six conditions enumerated by Mr. Francis Galton, *l. c.*, as necessary for domestication, viz.:—1. That the animal should be hardy; 2. That it should have an inborn liking for man; 3. That it should be comfort-loving; 4. That it should be found useful; 5. That it should breed freely; 6. That it should be gregarious. Æsop, Ælian, and Lactantius (*cit.* by Bochart, *Hierozoicon*, ii. 698) have, in various ways, remarked on the peculiarity of the pig as contrasted with other domestic animals, in that it is useful only when dead, giving neither milk, as does the cow, nor wool as does the sheep. With this peculiarity is connected the fact, useful for the often difficult task of deciding whether a particular skull came from a wild or a domestic breed, that domestic pigs are usually made useful while young. Rüttimeyer, indeed (*l. c.* p. 52), gives it as one of his reasons for supposing *Sus scrofa*, var. *palustris*, to be represented by a wild as well as by a tame stock, that its remains are usually those either of very old or quite young individuals. A pig will fatten while quite young; and whilst gaining nothing in its capacity of manufacturer of food in its own body, it loses in its capacity of a breeding animal with increase of age. This is not the case with the cow; and the discovery, therefore, of remains of very old individuals of this species only justifies us in inferring that the cow was a scarce and valuable animal in the period and place to which it belonged. See Rüttimeyer, 'Fauna der Pfahlbauten,' p. 10.

The special value of the pig as a domesticated animal is commonly expressed in an estimate that "twice the weight of food may be obtained from hogs than can be obtained from the same cost of food by means of any other animals" (Richardson, *l. c.* p. 42). In a little more detail, it is to be remarked that the pig, as a meat-producer, stands at an advantage (to the consumer), first, in the smaller relative weight of its "offal" as compared with the entire weight of its body, but secondly, and chiefly, in the large proportion of fat, the kind of food which is eminently the hardest for a savage or for the poor to procure, which it will store up upon almost any dietary. For this, see Lawes and Gilbert's invaluable Paper in the Royal Society's Transactions for 1859, "On the Composition of some of the Animals fed and slaughtered as Human Food," page 565 for relative proportion of offal, pages 513 and 543 for storing up of fat. It may be here remarked that De Blainville (*Ostéographie*, G. *Sus*, Introduction, p. 107) may very likely be right in suggesting that the pig may have furnished animal food to the earliest races of man before either cow or sheep, but that he could not have had our knowledge of the very various kinds of animals which, even in these days, furnish lower races of men with animal food, when he supposes that animal food must have been supplied by one or other of the three animals named. And his reason for such truth as his conclusions contain is, it is to be feared, but a poor one; it runs thus, "le Cochon étant l'animal qui sympathise le moins par ses qualités affectives avec l'espèce humaine a dû être celui qu'elle aura le moins répugné à tuer de sangfroid pour s'en nourrir; ce qui aura eu lieu plus tard et avec bien plus de répugnance pour le Mouton et pour le Bœuf."

† Zoographia, 1831, p. 267.

‡ Schweineschädel, 1864, p. 65.

as "Hauptschweine" and "Kümmerer" respectively; the latter of which terms has an equivalent in the word "Wreckling," applied in some parts of England to the supernumerary pig in a litter, *i. e.* to the one which makes the litter exceed the number of available teats, and fares accordingly. Two or three of the commonly reported facts* as to the pairing and period of reproduction of the wild swine account very sufficiently for these great differences in their size. Though the males are monogamous, severe battles nevertheless take place between them for the possession, it is said, of the largest females; the smallest females consequently are left for the vanquished, which will usually be the smallest males. Hence a great difference in the two sets of offspring would be reasonably expected. But, further, it is known that the wild, like the tame† swine, will breed long before the period of maturity; and that the offspring of such unions, whether both of the parents or only one be immature, are likely to be smaller in size as well as fewer in number, needs no argument.

Whilst no *à priori* probability can be gathered from any greater domesticability in favour of the claims of either European, Asiatic, or African *Sus* to be the exclusive source of our domestic pigs, and whilst mere size equally fails to differentiate these races, the point of the relation between the length and the height respectively of the lacrymal bone on which Nathusius has laid such weight (*Schweineschädel, passim et pp.* 9, 10, 83, 91, 92, 175), and to which Mr. Darwin has assigned so much importance ('Animals and Plants under Domestication,' vol. i. p. 70, ed. 1875), though in the immense majority of cases enabling us at once to differentiate the skulls of *Sus cristatus*, as indeed of the other Asiatic pigs without facial warts, from those of *Sus scrofa*, var. *ferus*, also sometimes fails us. Having measured a very considerable number of skulls of *Sus cristatus* from very various parts of India, and having invariably found them to have the orbital border of the lacrymal shorter than, or at most only just equal in length to the malar, and bearing in mind the constant reference made by Nathusius to the morphological and classificatory value of this proportional difference in the tame variety, the so-called *Sus indicus*, I was entirely unable to understand how that author could say (*l. c.* p. 185) that two skulls of *Sus cristatus* furnished to him by Mr. E. Gerrard differed from skulls of *Sus scrofa*, var. *ferus*, only in being smaller altogether. But after measuring the skulls from Sir Walter Elliot's collection and those in the British Museum, with the result of feeling certain that, from the contour, proportions, and, in adult males, the texture and sculpturing, together with the lacrymal of *Sus cristatus*, it was always possible to distinguish such skulls from those of our Wild Boar, I came, in the Royal College of Surgeons, upon a skull which, whilst possessing certain other peculiarities (to be hereafter detailed) as distinctive, more or less, of *Sus cristatus*, did combine with them the long lacrymal of *Sus scrofa*, var. *ferus*. This skull is numbered 3251 *a*, and was pointed out to me by Professor Flower, with his often experienced kindness, as being a skull of *Sus cristatus*,

* See Richardson, 'Domestic Pigs,' pp. 18, 19 (Warne, London); Samuel Sidney, 'The Pig,' p. 4 (Routledge, London); Blasius, 'Säugethiere,' p. 509, 1857; Wagner, 'Säugethiere,' p. 426, 1835; Brandt & Ratzeburg, 'Medicinische Zoologie,' p. 88, 1829.

† For period at which tame sows will breed, see Sidney *l. c.* p. 61; Low, 'On the Domesticated Animals of the British Islands,' p. 415.

which, together with two others, with the same appearance as to textural condition, had been brought out of the stores of the Museum into its series. Both these other skulls possessed the short lacrymal so characteristic, as the subjoined tables of measurements will show, of *Sus cristatus* and its allies, together with the other points usually observed in that animal's skull. The principal points, besides those of general *facies* and proportions, which appeared to me to justify this assignment of skull 3251 *a* (Royal College of Surgeons) were, in the absence of the shortness of the lacrymal:—first, the great prominence of what may be called the lacrymo-frontal ridge, that part of the frontal bone, to wit, which lies between the channel for the supraorbital nerve mesially and the upper border of the lacrymal bone outwardly; secondly, the great relative development of the part of the third molar which is posterior to the two anterior bicuspitate lobes of that tooth; thirdly, the absence of convexity backwards in the naso-frontal suture. These three points are usually present in *Sus cristatus*, as seen in figures 4 and 6, appended to this paper, and taken from two Indian specimens; and they are usually found to be accompanied by the fourth peculiarity of a short lacrymal. One or other of these characters may be absent; but in an undoubted specimen of an adult male *Sus cristatus* I have never seen more than one of these missing; whilst it is rare for the second, and very rare for either the first or the third, to be found in undoubted specimens of the Palearctic Wild Boar. In a skull figured by Mr. Richardson (*l. c.* p. 50), from “an excavation in an island on Loch Gur, a lake in the neighbourhood of Limerick,” and “found in company with skulls of oxen, goats, sheep, red deer, reindeer, and our extinct gigantic deer, sometimes erroneously styled the Irish Elk,” but considered by Nathusius (p. 150) to have belonged to a domestic animal, it is true that the lacrymo-frontal ridge is represented as of great size; but we must set against the assigning of much importance to this fact the considerations that the drawing is taken from a reconstructed skull, that it is obviously inaccurate in some points, as, for example, like a drawing in S. Müller's *Verhandel.* (Taf. 28 bis, fig. 3), in having an extra tooth posteriorly to its canines, and that it may consequently be supposed to be likely to be inaccurate in other particulars also. The fronto-lacrymal ridge is, of course, in the adult underlain by a prolongation of the frontal sinuses; it is, however, visible enough in very young specimens of domestic pigs, which show other points of affinity to the *Sus indicus* long before the frontal sinuses are fully developed; and I am inclined to think it may sometimes, though certainly not always, be detected in very young specimens of *Sus scrofa*, var. *ferus*, such as the one figured by Nathusius, *l. c.* (Taf. i. fig. 1, Taf. iii. fig. 13). Though the fulness of this region is due in the adult partly to its being underlain by frontal sinuses, which are relatively small in the early stages of the animal's life, there is still some justification for regarding this structure as an instance of the retention by the adult of an early structural arrangement; for it is easy to understand that the contour described by the external tables in early youth may be carried out conformably by the bloodvessels of the scalp as the animal grows older. A parallel to such a process is furnished to us very frequently, though by no means so nearly universally, by the retention in the adult *Sus cristatus* of that fulness and convexity of the vertical aspect of the fronto-parietal region which is characteristic of *Sus scrofa*

both wild and domestic, as well as of *Sus cristatus* and *Sus indicus*, at birth*. Lieutenants W. E. Baker and H. V. Durand, in their paper on "Subhimalayan Fossil Remains of the Dádupúr Collection," in the Journal of the Asiatic Society of Bengal, vol. v. 1836, p. 664, observe of the two fossil skulls which they describe, that in both "there is in the frontal plane a total absence of convexity. As this plane ascends there is a tendency to concavity, in consequence of the parietal crests being more strongly marked than in the existing species, and thus producing the appearance of a gentle hollow where, in the common Wild Hog, there would be a gentle swell." Further on, in the same paper, the authors remark:—"From the form of the cranium, the shape of the canines and incisors, and the other points in which the fossil differs from the existing species of the country, a specific difference may be inferred; for the dissimilarity, although less than that which occurs between the *Babyrussa*, the *S. larvatus* and the *Sus scrofa*, or Common Hog, is too remarkable, particularly in the shape of the canines of the lower jaw, to admit of the fossil being considered as a mere variety of the *Sus scrofa*." Sir Walter Elliot, however, to whom I owe this reference as well as other things, writes me to the effect that the skulls sent by him to me "do not seem to differ much from the Subhimalayan fossil specimens figured and described," as above specified. And it is worthy of being put upon record that of five skulls of modern Wild Indian Hogs thus sent by Sir Walter Elliot, three show the upgrowth of parietal crests, which Lieutenants Baker and Durand had supposed to be characteristic of the fossil animal, and to contribute towards justifying its claim to be considered specifically distinct. These three skulls have the following labels and histories appended to them by Sir Walter Elliot, which, when coupled with the localities assigned below to the British-Museum specimens (specimens not, so far as I can see, different in any essential point from Sir W. Elliot's), bear importantly on the question of the unity of *Sus cristatus*:—

No. 71. Large Boar, killed near Rajkote, in Kattywar, June 4, 1832. He was with a large sounder, and ripped two horses severely. Rajkote is in the extensive open plains of the Kattywar peninsula.

No. 330. Nilgherry Hills, 1840.

No. 428. Jaggiapettah, 1851. On the east side of the Madras Presidency, in the Masulipatam district, on the high road from Masulipatam to Hyderabad.

These three skulls agree in having their third molars considerably worn and their canines large, their muscular insertion-surfaces marked with polygonal reticulations† in some places, and with arborescent markings in others, and, thirdly, in the spar-like hardness and density of the bones generally; and they must be supposed consequently to have belonged to old and powerful male animals. In all of these points they differ more or less from the other two skulls, also of male but of younger and less powerful animals. But such differences as these are far from being of specific value, either in comparison of modern races with fossil ones, or in comparison of modern races *inter se*. All the five skulls, however, lent to me by Sir Walter Elliot possess the lacrymo-frontal ridge developed into a very considerable prominence; and though every now and then I have

* See Nathusius, pl. i. figs. 1 & 3, pl. iii. fig. 13, and pp. 3 & 13. Compare the mesial fulness in the frontals of *S. papuensis*. † For similar reticulation in *Bos primigenius* see Rütimeyer, Fauna der Pfahlbauten, Taf. iii. fig. 3.

had occasion, in going over the extensive series of skulls of Indian Wild Hogs which have been available to me, to note an almost, I have never noted an entirely complete disappearance of it. The fronto-lacrymal ridge is not, even in the aged hog, a mere expansion or dilatation of the frontal bone: it is underlain, it is true, by an arm of the frontal sinuses; but it has thick and independent walls of its own. Though not quite exactly homologous with the supraciliary ridges of human anatomy, it is nevertheless very closely comparable with them. In some varieties of the human species the supraciliary ridges, whether underlain by sinuses or not, are very constantly developed into great prominences. In a classification, indeed, of human crania proposed by Dr. Williamson*, "skulls with the supraciliary ridge so prominent as to overshadow the face" formed one out of four classes into which all crania were divided. It is not necessary to go so far as this for acknowledging that this character may become, in the Suidæ at least, a race character†.

The second in order of the three points which, taken together, as they usually exist together, with the fourth, that relating to the lacrymal, help us to identify *Sus cristatus*, is complexity of its third molar, at least in male specimens, and specially the complexity of that part of the tooth which lies posteriorly to the two primary bicuspidate lobes.

A reference to my description of fig. 8 (where the third lower-jaw molar of *Sus andamanensis* represents this often complex tooth reduced to great simplicity) will enable the reader to understand this second point of distinction between *Sus cristatus* and *Sus scrofa* more readily than any verbal description, however long, without such reference. It may be sufficient to say here that the division of the third molar which lies posteriorly to the two anterior lobes, is, in the male *Sus cristatus*, equal sometimes in size to and sometimes even greater than both those other lobes taken together. This is not often, though it is occasionally, the case in *Sus scrofa*, var. *ferus*, of modern times. Nor is it the case in the females of *Sus cristatus*; so that the greater development observed in the males may perhaps be due to the working of the law of sexual battle. The large size of the canines postulates a large determination of blood to the jaw; and the large size of the third molar, a tooth evolved at the period of sexual maturity, when the animal "venerem et prælia tentat," may be, to use a word suggested long ago by myself‡, "tautogeneous" with it. Still the fact that the third molars are small both in *Sus barbatus* and *Sus barbirussa* shows that this smallness cannot always be explained on physiological grounds.

The third point, that of the straightness of the naso-frontal suture, appears to have some classificatory value, whether we look at it with the light furnished by its importance and validity in the classification or identification of other animals, or in that furnished by the facts of its own developmental history.

The nasal and the frontal bones together form a roof over the ethmoid and the turbinal bones; and as there is no apparent physiological reason why they should contribute in

* Observations on Human Crania in Museum, Fort Pitt, Chatham, 1857.

† It is observable in the pigmy Nepal pig, *Porcula salviana*, as also in the African *Potamochoerus*. It does not appear to me that male Suidæ possess it more markedly than females; and herein it differs from the supraciliary-ridge development as seen in our own species, as also from the race-mark to be next mentioned. An analogous eminence, rudimentary in *S. papuensis*, occupies the middle frontal line over an area homologous with the human glabella in each of four pig's skulls brought from the Admiralty Islands by H.M.S. 'Challenger.'

‡ Nat. Hist. Rev. Oct. 1861, p. 486.

different proportions towards the securing of this end, the fact that they do so is of so much the greater morphological value. In *Sus cristatus* the naso-frontal suture very ordinarily runs, as may be seen in fig. 4 (and in *Sus andamanensis*, in fig. 3), straight across the roof of the ethmoid, at right angles to the long axis of the skull; or the frontals may intrude themselves mesially between the nasals, making thus the contour of the suture to be convex forwards. Precisely the reverse is the case in the adult European Wild Boar. Some weight has been laid * upon a similar conformation in the skull of the Tiger, as being of service in differentiating it from the skull of the Lion; and though it is not pretended that an equally great distinctness can be supposed to exist between the two animals now under comparison, still the structural differences in the two sets of cases are analogous.

But when we come to look at the skulls of developing Pigs, we see that real value attaches, from this point of view also, to the relatively greater or less extension backwards of the nasal bones, and the contour described consequently by the naso-frontal suture. A tape crossed at right angles to the long axis of the skull from one infra-orbital foramen to the other, passes very closely in front of, and often parallel with the naso-frontal suture in the very young pig; the suture gets removed further and further away from it as the pig increases in age. Nathusius (Taf. iii. figs. 11 and 13) has figured the skulls of a young Wild Boar and of an adult Wild Boar upon the same plate; and the straight line of the suture of the former contrasts most instructively with the backwardly arching contour of the latter. The straightness, therefore, of the naso-frontal suture may be supposed to illustrate the principle that climatic or other conditions may cause structural arrangements to be permanently retained in certain races whilst they are obliterated in others. The retention of the prolongation of the sagittal suture over the frontal region is believed, with much reason, to be hereditarily transmitted in our own species; and I incline to think that the persistence of the frontal tubera with very much of their infantile eminence, which we see not rarely in adult men, may be taken as furnishing another parallel to the retention in some degree, by the adult *Sus cristatus*, of the characters of the young animal's naso-frontal relations.

In the fourth place, as regards the value of the relative shortness of the lacrymal bone as a means for differentiating the skulls of *Sus cristatus* and its allies from those of *Sus scrofa*, var. *ferus*, I was for a long time of opinion that the same might be said of this all but invariably observed peculiarity of *Sus cristatus*, which I have already said, however shortly, of the straightness of its naso-frontal suture; and that all this may, *mutatis mutandis*, be repeated as to the lacrymal's peculiarities in the two subspecies there can be no doubt. Anybody who will examine the figures given in Spix's 'Cephalogenesis,' or the reproduction of them in Erdl's 'Tafeln der vergleichenden Anatomie des Schädels,' 1841, can convince himself of the fact that the malar border of the lacrymal is very short as compared with its orbital border in the young Pig †; and if he extend his observation to the various adult Suidæ, he will find

* Ost. Catalog. Royal College of Surgeons of England, 4506. p. 706.

† Though I do not suppose that it would be possible to say in 1876 what Dr. Gray said (Proc. Zool. Soc. 1868, p. 19) in 1868, to the effect that Nathusius's works were not to be had either in the Library of the British Museum, or in

that this side of the bone goes on growing from a condition of permanent inferiority in *Sus andamanensis* till it reaches subequality or entire equality with the orbital length in some Suidæ—such as *Sus cristatus*, *Sus vittatus*, *Sus leucomystax*, *Sus taivanus*, *Sus timoriensis*, *Sus papuensis*, and *Sus barbatus*, all Suidæ without facial warts—and finally exceeds the orbital border in length considerably in *Sus scrofa*, var. *ferus*, and ordinarily in *Sus verrucosus* (and *Sus celebensis* ?), and disproportionately, it may be added, in the African Wart-Hog, *Phacochærus*.

There is no doubt that the younger the pig the greater is the distance separating its lacrymal's length from equality with or superiority to its lacrymal's height; but the subjoined tables and the description of my figures show that there is no constant relation to be observed between the growth of the entire facial skeleton out of the short proportion of early days into the elongated muzzle of the adult, and the longitudinal evolution of the lacrymal factor of that snout. The longest snout, such as that of the adult *Sus barbatus*, may, as Nathusius has remarked with surprise (p. 167), show a lacrymal with the proportions of the domestic *Sus indicus*, or the immature *Sus scrofa*, var. *ferus*; and I venture to suggest that the elongation of the lacrymal, which Professor Owen taught us to call a "mucodermal bone," may be correlated with the evolution of the facial warts which are found in all the Suidæ with such lacrymals. If these two structures are thus correlated, we come to be able to explain how it is that the length of the lacrymals is, though not very variable, still as variable as we have found it to be; for the facial warts themselves are a variable structure, as we should from several analogies expect them to be. If they were not so, it would be difficult to explain how it is that in many zoological descriptions * of our European Wild Boar, no mention is made of the presence of warts (small ones, it is true) immediately below the eyes; and inasmuch as they are so variable, and probably more liable † to disappear in the female sex, we can, on the hypothesis of the evolution of the lacrymal in length being correlated with their

the library of either the Zoological, Royal, or Linnean Society, it may nevertheless be convenient to give here the results of his measurements of the borders of the lacrymal bones at different periods of the life of *Sus scrofa*. They stand thus at p. 10 of his work of 1864:—

Lacrymal bone.	Newly born. millim.	2 months old. millim.	6 months old. millim.	Adult. millim.
Height	7	13	18	21
Frontal border	11	20	42	60
Malar border	3	6	25	35
Ratio of height	1	1·9	2·6	3
Ratio of frontal border	1	1·8	3·8	5·5
Ratio of malar border	1	2	8·3	11·6

* De Fatio, in his 'Faune des Vertébrés de la Suisse,' 1869, p. 354, goes, if I understand him rightly, further than this, by using the words "Pas de saillies sur la face en dessous des yeux," in his definition of "Le Sanglier ordinaire, das wilde Schwein."

† Dr. Gray, in his description of *Potamochoerus africanus* (P. Z. S. 1868, p. 34), says of the male animal's face, that it is "swollen and often warty on the sides in front," and of the females, that "the side of the nose is simple." Fitzinger, however, whose descriptions of the external characters appear to be carefully done, does not say that any such sexual difference exists in this species or in any other of the Suidæ with warts. There are other reasons, however, for the suggestions in the text, of which the sexual limitations of the facial callosities in the Orangs may be taken as an example.

presence, understand how the lacrymal is sometimes found to be shorter than we should have expected it to be in skulls such as those of the wild sows from prehistoric deposits in this country, measurements of which are given below.

As the interpretation I suggest of the proportions observed to exist between the length and height of the lacrymal bone depends upon the method of gradations, as applied not only to several varieties, but indeed to several species of *Suidæ*, as well as upon a history of the development of the bone, it will be well now to give a short list of those species—pointing out the particulars which justify their claim to that rank, and contrasting them with the aggregate of characters which do enable us, as a matter of fact, to differentiate such forms as *Sus cristatus* from *Sus scrofa*, possibly without justifying us in considering them distinct species.

And first of *Sus barbatus*. I am in no way inclined to give too much weight to differences in colouring or in character of hair or bristles; still a glance at the drawing of this animal in S. Müller's *Verhandl. Taf. 30*, showing its half black, half tawny, wavy, not crisply, curling beard, its ochraceous dorsal stripe, and its tail ending in a considerable brush, impresses one with the idea that it is impossible that the bony structures should not make some approach at least to a similar diversity from other forms of *Suidæ*. This anticipation was fully borne out by an examination of four skulls, two of which are in the British, and one in the Oxford Museum—and of Sehlegel's figure of the skull described by him, and S. Müller, *Verhandl. pp. 173, 179–181, and Taf. 31. figs. 4 & 5*.

The skull of *Sus barbatus* is absolutely longer than the skulls either of *Sus scrofa*, var. *ferus*, or *Sus cristatus*; and relatively to the body its length is considerably greater, being, as given by Fitzinger, no less than $\frac{3}{8}$ of the length of the trunk. The contour described by its sagittal suture is, as my figures show, strikingly different from that described by the corresponding suture in most other *Suidæ*; its highest point is some way in front of the plane of the occipital squama, and occupies a level far above the plane occupied by the anterior half of the frontal or by the nasal bones; and these latter bones make up more than one half of the entire length of the skull, resembling herein the typical *Sus scrofa*, whilst the naso-frontal suture resembles that of *Sus cristatus*. Its maximum interzygomatic width is in the middle of that arch, not at its posterior border as in most other *Suidæ*.

In addition to these larger points, the following may be mentioned as having a great morphological importance, though relating to smaller structural peculiarities. The third molar consists of three lobes; but, large as is the jaw and the canine armature of this *Sus*, the most posteriorly placed of the three lobes is more simple than even the very simple posterior lobe of the pigmy *Sus andamanensis*, having only one cusp prominently marked in the upper, and four in the lower jaw, whilst the entire posterior lobe is little, if at all, greater in antero-posterior extent, and much smaller in transverse, than either of the anterior, differing thus altogether from *Sus cristatus*.

A second point, relating to a small structure as measured by the callipers, which is a very large one, however, to the morphologist, is the permanent retention by *Sus barbatus* of the mesopterygoid of Parker (*Phil. Trans. 1874, p. 324, pl. xxxvi. fig. iv. ms.pg*) as a distinct bone. This peculiarity was observed in all the four skulls of *Sus barbatus*

examined by me; and its obvious general significance is increased by the fact that it is in the area of the mesopterygoid that the great basiscranial cavities are excavated in the *Babirussa* and *Phacochærus*, and are represented rudimentarily in *Sus vittatus*.

Knowing what we do* of the affinity of the fauna of the subregion of Ceylon and South India to that of Malaya, there is no *a priori* improbability in a view which should accept the *Sus ceylonensis* of Blyth † (Journal of the Asiatic Society of Bengal, xx. p. 173) as identical with the *Sus barbatus* of Borneo. Mr. Blyth's words, *l. c.*, are as follows:—" *Sus zeylanensis*. Skull longer than that of the Indian Boar, nearly straight in profile, very much contracted at the vertex. Palate contracting posteriorly to less than 1" from the magnitude of the last molar, which is considerably larger in both jaws than in the Wild Boar of India, the upper measuring $1\frac{3}{4}$ " long by $\frac{1}{16}$ " broad anteriorly. Vertex narrowing to 1" only in breadth. Total length of skull from vertex to tips of nasals $16\frac{1}{4}$ ". Altogether the skull approximates closely in contour to the figures of the skulls of *Sus barbatus* by Dr. S. Müller and M. Temminck." Dr. Gray appears to have had access, which I have not had, to a photograph of this *Sus zeylanensis*, and says that, judging from it, "the skull is much shorter and thicker than the skull of *S. barbatus*. The photograph is much more like that of *Sus verrucosus*." For my own part, I cannot think Mr. Blyth would ever have spoken of a real male *Sus barbatus* as having a skull with a straight profile; Müller and Schlegel figured a female skull, whereas Mr. Blyth's, I am sure, was a male's. As regards the contraction of the vertex, which shows Mr. Blyth's skull to have been a male's, this is sometimes exceeded by the old and strongly muscular Indian Wild Hog, such as Sir Walter Elliot's No. 71 (for history of which see p. 261), where it is only 8", whilst in the skull No. 72 it is 1·8", showing an oscillation, owing to the varying action of the temporal muscles which entirely deprives it of any morphological value; and the measurements of the molars, finally, assure me that there is no need to add the words "und wahrscheinlich auch Ceylon" to the word "Borneo" as the "Vaterland" of *Sus barbatus*, as Fitzinger has done, *l. c.* p. 393. Müller and Schlegel, p. 179, give Borneo, if I rightly read their words, as the "habitat" of this well-marked species.

Secondly, of *Sus verrucosus*. The soft and perishable parts of *Sus verrucosus* are even more interesting and of greater importance than the bones; for they show us that wild pigs do have appendages—warts, to wit, covered with long bristles, and attached to the corners of the lower jaw, like those of the Irish Greyhound Pig, once so plentiful in Galway; and they thus do away with one of the objections to Mr. Darwin's views, stated fairly (by himself) in the work on Animals and Plants under Domestication, i. p. 79, ed. 1875. If it is a profitable thing to lay Müller and Schlegel's figure of *Sus verrucosus* (tab. 28. *l. c.*) alongside of Richardson's figure of the "Old Irish Greyhound Pig" (*l. c.* p. 49; Darwin, *l. c.* p. 79), it is profitable also to read the Dutch letterpress ‡ of the two former authors,

* Tennant, Nat. Hist. of Ceylon, pp. 61–68, 186; Wallace, Geographical Distribution, i. p. 328.

† See Gray, Proc. Zool. Soc. 1868, p. 24; Brit. Mus. Cat. 1869, p. 331.

‡ The words of the two Dutch naturalists are, Verhandel. p. 177. "De deer jonge voorwerpen dezer sort zijn niet gestreept, en onderschieden zich daardoor van de jongen van *Sus vittatus* en van de meeste, ja, misschien van alle overige soorten." It is much to be regretted that Dr. Gray did not enter a note of this most important fact in his papers above referred to, in which the 'Verhandelingen' are often cited.

from which we learn, when helped by the translation given by Fitzinger, that the young of *Sus verrucosus* are never striped, and hereby have it suggested to us how it may be that so many of our domestic breeds never have their young striped—none, in fact, except the Westphalian and the Turkish. Rütimeyer (*l. c.* p. 187) has suggested that the so-called “Berkshire breed” of domestic pigs may have its parent stock in *Sus celebensis*, as figured by Schlegel and S. Müller, which resembles it in the great transverse development of its skull, the verticality of its forehead, of its occiput, and its temporal fossæ, in the height of its zygomatic arch, and specially in the remarkable height and massiveness of its lower jaw. There is no doubt that *Sus celebensis* is very closely allied to *Sus verrucosus*, having not only the same general facies but the same peculiarities, though on a smaller scale, as those whence the Java pig has taken its name. The chief point of difference which Rütimeyer points out between the figured *Sus celebensis* and the Berkshire breed depends upon the artist, I apprehend—being, as it is, a greater length of the molar series, which, however, consists of 8 teeth in the figure of *Sus celebensis* (*Verhandeligen*, pl. 28 *bis*, fig. 3); and it is possible enough that the young of *Sus celebensis* (the contrary not having been definitely recorded) may be like the young of *Sus verrucosus* in not being striped, and that they may thus have resembled the young of the Irish Greyhound Pig, as when old they actually do resemble it in the development of the mandibular warts.

As regards the skulls of *Sus- verrucosus*, figured tab. 32 by Müller and Schlegel, the lacrymal in fig. 4 appears to have the favourable relation of length to height which is characteristic usually of the other Suidæ with facial warts; whilst in fig. 1, which was taken from a very old individual, the height and length would appear to be subequal, as in the skull (fig. 6) of *Sus vittatus*, on the same plate. I should have set less store by this variation in the two drawings than I do, if Nathusius had not distinctly recorded (p. 179 *l. c.*) that this latter is the relation in the *Sus- verrucosus* skull in his possession. On the other hand, all the undoubted *Sus- verrucosus* skulls which I have been able to measure have presented the elongated form of this bone; and the closely allied species *Sus celebensis*, as figured in Müller and Schlegel’s fig. 3, tab. 28 *bis*, may or may not have the long lacrymal usual in that pig. But, on the whole, I should certainly accept the position that the elongation of the lacrymal was not constant in *Sus verrucosus*, though it has been so in the skulls I have seen; and with this position I should hesitate to assign to this peculiarity all the value which Nathusius’s insistence might lead one to assign to it.

Taking, in the second place, this variability in the proportions of the lacrymal bone, and coupling with it, first, the absence of striping in the young, and secondly the presence of mandibular warts, such as one of our domestic breeds, viz. the Galway Greyhound Pig, still retains, or did till quite lately retain, we may be tempted to think that some form allied to *Sus verrucosus* or *Sus celebensis* may have been the single parent stock of all our domestic breeds, except, of course, such as the Westphalian and Turkish, which are striped in their youth, and would be referred to the indigenous *Sus scrofa*, var. *ferus*, as their parent stock. In favour of such a view, we have, of course, the general principle “*Entia non sunt multiplicanda præter necessitatem*.”

But the wide range* of *Sus vittatus*, over Java, side by side with *Sus verrucosus*,

* It is interesting to compare with these statements, as to the geographical distribution of the Asiatic Suidæ, the

over Borneo with *Sus barbalus*, and, as stated, also over Amboyna, Macassar, Banka, and Sumatra, gives it special claims to attention. This Pig appears to me to be very closely allied indeed to *Sus cristatus*, and to be similarly and readily distinguishable from our European Wild Boar. In this latter point I differ from Rütimeyer (*l. c.* p. 187), whilst I should agree with him in considering it all but identical with *Sus leucomystax*. The claims of *Sus vittatus* and *Sus leucomystax*, and *Sus taiwanus* of Formosa (occurring, as they do, in an area comprising Japan as well as Java), to have given origin to *Sus indicus*, the domestic Chinese pig, in days sufficiently far off to have allowed the tendency to striping of the young to become eliminated, are very strong, and can scarcely be considered antagonistic.

Closely allied as *Sus cristatus* is to these races, its severe struggle for existence entailed by its *habitat* on a continental area tenanted by the tiger (*Felis tigris*), as well as other Carnivora unfriendly to Suidæ, appears to me to have specialized it, especially as regards its dental armature and the bones which carry it, into divergence from the probable line of parentage of the inconveniently so-called *Sus indicus*. *Sus andamanensis*, on the other hand, and, I am inclined to think, one or two other of the Asiatic *Suidæ*, show, from a precisely opposite cause, that of restriction to a very confined area, the same divergence from what I have imagined the present stock of the Chinese breed may have been. But against any such speculations about what we do not see in the darkness of past ages we have to set what we can see by travel in the broad daylight of the present, viz. that almost all *Suidæ* are readily domesticable by savages in almost every quarter of the globe; and what savages do now they may very well have done formerly.

I have not been able to institute any satisfactory examination into the relations of the Æthiopic to the Asiatic *Suidæ*; and I should welcome an opportunity of examining skulls and skins of the true *Sus* seen by Dr. Murie and Dr. Barth in Central Africa. It would be additionally satisfactory if investigations could be set on foot as to the existence or non-existence in this *Sus* of the Cystic form of *Tenia solium*, which certainly exists in *Sus cristatus*. Dr. Cobbold informs me that *Tenia mediocannellata* is the *common* tapeworm of Indian as of other patients; but I apprehend that, as it has been so very definitely laid down by others † that the Pig is at least one source whence inhabitants and sojourners in India become infested with tapeworm, it would be premature to conclude the reverse even from his authoritative statements. It must be very difficult to prove a negative here.

The facts of most direct importance, however, in investigations as to the relationships

following words from M. Gabriel de Mortillet's memoir in the 'Revue d'Anthropologie,' iv. 4, 1875, p. 653, as to the origin of bronze:—"Reste le groupe de l'extrême Orient Asiatique. C'est là évidemment où il faut chercher l'origine du bronze. Les principaux gisements sont dans la presqu'île de Malacca et surtout dans l'île de Banca, mais ils s'étendent dans d'autres îles de la Sonde et remontent jusque dans l'empire Birman où l'étain est encore exploité actuellement dans le district de Merguy. Ce minéral, dans tous ces gisements se recueille de la manière la plus simple et la plus facile dans les alluvions. Ce sont bien certainement les alluvions les plus riches du monde en étain et celles qui occupent la plus grande étendue. Il est donc tout naturel que ce soit celles qui les premières aient attiré l'attention de l'homme. Le cuivre se rencontre dans les mêmes régions. Tout le monde connaît les gisements de cuivre des îles de la Sonde, Timor, Macassar, Borneo. La Birmanie anglaise présente des mines de cuivre à côté des ses exploitations d'étain. Le pays se trouve donc dans les meilleures conditions pour avoir vu naître l'industrie du bronze." *Gallus bankiva*, the parent stock of our Common Fowl, is found over the same area.

† Notably by Dr. Charles A. Gordon, Medical Times and Gazette, May 2, 1857, p. 429; and by Dr. T. R. Lewis, Appendix B. to Eighth Annual Report of the Sanitary Commissioner with the Government of India, 1871.

of Prehistoric to modern races are those of the great variations observed—first, in the entire size of the individual animals, and, secondly, in the proportions of particular bones, and notably of the lacrymal bones, in specimens from the same species or subspecies of *Suidæ*. In view on the one side of this twofold variability which is explicable upon acknowledged physiological principles, and affects the wild races both of Europe and Asia, and, on the other, of the aptness for domestication possessed by *Sus scrofa*, var. *ferus*, it appears to me to be unsafe to postulate for Prehistoric British Swine any other parent stock than the one just named. On the other hand, such is the diffusibility and transportability of *Sus* that it is not impossible, nor inconceivable, that the domestic European Pig, even of the Stone Age, may have had an Asiatic or African origin. As regards the Bronze Age, indeed, if its tin and copper did really come from the East, such a view cannot be said to be even improbable. But the acceptance of it does not seem to me to be necessitated by the facts.

Measurements of the Orbital and Malar Borders of the Lacrymal Bone.*

I. *Sus cristatus* and its allies.

Skull of Indian Wild Boar, *Sus cristatus*, no. 72. Sir Walter Elliot's collection. Killed about 1830, at Haugul, S.W. corner of Dharwar province, in South Mahratta country.

Height of lacrymal 1 in. ; malar border 1 in.

Skull of Indian Wild Boar, *Sus cristatus*, no. 46. Sir Walter Elliot's collection, shot at Dendelly 12th April, 1831, in the great forest tract between Dharwar and Goa.

Height of lacrymal 1 in. ; malar border 1 in.

Skull of large Indian Boar, *Sus cristatus*, killed near Rajkote, in Kattywar, June 4, 1832. He was with a large "sounder," and ripped two horses severely. No. 71 in Sir Walter Elliot's collection.

Height of lacrymal 1·0 in. ; malar border 0·8 in.

Skull of Indian Wild Boar, *Sus cristatus*, no. 428 in Sir Walter Elliot's collection. From Jaggia-pettah, on the east side of the Madras Presidency, in the Masulipatam district, on the high road from Masulipatam to Hyderabad. An old male with some obliteration of sutures.

Height of lacrymal 0·95 in. ; malar border 0·95 in.

* To this paper I append a number of measurements, taken from various *Suidæ*, of the length and height of the lacrymal bone, this point having had great weight laid upon it by Nathusius, and holding good within very considerable limits. I have not given any measurements relating to the widening of the palate (a second point insisted upon by Nathusius), because, as regards the wild races, I have found that this widening of the interpremolar, as opposed to the intermolar transverse diameter of the palate, is sometimes found in specimens which undoubtedly belong to wild European boars, whilst, on the other hand, the two measurements are usually subequal in the other wild races, such as *Sus cristatus*, which I have measured. In taking the length of the lacrymal along its malar border, some little ambiguity is caused by the fact that in many specimens the lip of the orbit is a little everted, so as to resemble to some extent the spout of a mortar rather than the rim of a cup at the line of junction of the malar with the orbital border of the lacrymal. Where the differences between the heights and lengths are measured by tenths or twentieths of an inch or by millimetres, this structural arrangement may make the measurements vary importantly. There is, however, always a line separating the part of the lacrymal which is to be considered as belonging to the inner aspect of the orbit from that which is strictly facial ; and from this line the measurements have been taken. The frontal border of the lacrymal, again, often bends downwards just before reaching its orbital edge, just posteriorly to the plane of the lacrymal canals, thereby curtailing the height of the bone for the distance corresponding with this deflection. My measurements have been taken in the plane occupied by the lacrymal canals, so as to avoid this source of fallacy.

Skull of young female, *Sus cristatus*. British Museum, 716 m. "Terai, Nepal; Dr. Oldham."
Height of lacrymal 1.1 in.; malar border 0.75 in.

Skull of adult female, *Sus cristatus*, 716 n. British Museum. "India; Professor Oldham."
Height of lacrymal 0.1 in.; malar border 0.7 in.

Skull of young female, *Sus cristatus*, about 9 months old. British Museum, 716 q. "Nepal; B. H. Hodgson."

Height of lacrymal 0.9 in.; malar border 0.75 in.

Indian pig, *Sus cristatus*, British Museum, 716 g, under 5 months of age, very convex frontals, slightly tumid lacrymo-frontal ridges.

Height of lacrymals 0.5 in.; malar border 0.25 in.

Indian pig, *Sus cristatus*, British Museum, 716 v. "Nearly adult female, Nilgherris."

Height of lacrymal 0.95 in.; malar border 0.6 in.

Young male of *Sus indicus*; in collection of British Museum, not catalogued; with 3rd molar just coming into use—that is to say, about 18 months old.

Height of lacrymal 0.9 in.; malar border 0.9 in.

Skull of Indian Wild Hog, *Sus cristatus*, no. 3251 a, Royal College of Surgeons of England. This is the skull of an adult male probably, the complexity of the posterior lobe of the 3rd molars being very great. The naso-frontal suture resembles that of *Sus scrofa* rather than that of *Sus cristatus*. The lacrymo-frontal ridge is very largely developed.

Height of lacrymal 0.1 in.; malar border 1.25 in.

Skull of Indian Wild Hog, *Sus cristatus*, no. 3251 b, R. C. S. England.

Skull of Indian Wild Hog, *Sus cristatus*, no. 3251 c. R. C. S. England.

Height of lacrymal 0.1 in., malar border 0.95 in., in both.

These two skulls were probably from the same district as no. 3251 a; but they differ from it, and agree with all the other specimens of *Sus cristatus*, in having the height and the malar length of the lacrymal subequal.

Skull of Wild Sow from Andaman Islands, *Sus andamanensis*, no. 1511 b, Oxford University Museum.

Height of lacrymal 17 mm.; malar border 8 mm.: adult.

Skull of *Sus vittatus* from Amboyna. Alfred Russel Wallace, Esq. British Museum, "1362 c." An adult male with a nearly straight naso-frontal suture, and a convex fronto-parietal region.

Height of lacrymal 0.55 in.; malar border 0.8 in.

Sus vittatus. British Museum, 1362 f. "Skull of animal developing the hinder molar." The lacrymo-frontal ridges are convex, the frontal region is flat, the naso-frontal suture, however, is straight, as in *S. cristatus*.

Height of lacrymal 1.05 in.; malar border 0.6 in.

II. *Sus scrofa*, var. *ferus*, and its allies.

"*Sus libycus*." British Museum, 713 a. "*Hab.* Asia Minor, Xanthus (Sir Charles Fellowes). The skull is very distinct from all the skulls of the Wild Boars from Germany in the British Museum." The animal was just about 18 months old: its interorbital region is still convex; but it has no very marked lacrymo-frontal ridge; its naso-frontal suture is convex backwards, as in *Sus scrofa*, var. *ferus*; its nasals are 8 in. long. as against $14\frac{1}{2}$ of total skull-length; and the height of the lacrymal is less than its inferior length. Here it resembles *Sus scrofa* rather than *Sus cristatus*.

Height of lacrymal 1 in.; malar border 0.15 in.

Wild Boar from Germany, *Sus scrofa*, var. *ferus*, 3253 a: Royal Coll. Surg. England, adult.

Height of lacrymal 0·9 in.; malar border 1·5 in.

Wild Boar from Germany, *Sus scrofa*, var. *ferus*. Oxford University Museum, 1513 a. All teeth in place.

Height of lacrymal 1 in.; malar border 1·5 in.

Wild Boar from Germany, *Sus scrofa*, var. *ferus*. Oxford University Museum, 1513. Presented by Prof. Max Müller; with all teeth, except 3rd molar, in use; 16 months old.

Height of lacrymal 0·75 in.; malar border 1·05 in.

Young Wild Boar, *Sus scrofa*, var. *ferus*. Royal College of Surgeons of England. With first molar only through, therefore between five and six months old, with frontals still very convex in vertical aspect, but with flat lacrymo-frontal ridge.

Height of lacrymal 0·7 in.; malar border 0·7 in.; frontal border 1·5 in.

Skull of old Wild Sow, *Sus scrofa*, var. *ferus*, from alluvium near Oxford. Figured Plate XLI. fig. 2, from the Geological Collection, Oxford University Museum.

Height of lacrymal 17 millims.; malar border 18 millims.

Skull, from peat, of Wild Sow, *Sus scrofa*, var. *ferus*. British Museum. With 3rd molar through.

Height of lacrymal 0·8 in.; malar border 1·05 in.

Skull from silt of old bed of Lea river, shown to me in British-Museum Geological Collection by Mr. Davis. Under 18 months.

Height of lacrymal 0·6 in.; malar border 0·5 in.

Second skull from same locality, and in British Museum, with all the teeth in place, and the third molar with considerable complexity in its posterior lobe.

Height of lacrymal 0·6 in.; malar border 0·8 in.

Skull of *Sus scrofa*, var. *ferus*? British Museum, 713 i. Skull of a young animal from the Zoological Society's Museum. The animal was about 16 months old, all the teeth being in place except the third molars above and below. There is still some convexity across the frontals, though flattening is beginning on either side towards the orbital processes. The lacrymo-frontal ridge is not markedly convex; the nasals are convex backwards in the middle line.

Height of lacrymal 0·9 in.; malar border 0·75 in.

Skull of *Sus scrofa*, var. *ferus*? British Museum, 713 k. Skull of young animal about 6 months old, from the Zoological Society's Museum. This skull was entered in the Catalogue of the Zoological Society's Museum under the label A. 763; but no locality was recorded under this heading. The frontals are convex from the level of the supraorbital foramina backwards; the fronto-nasal suture is straight, nearly as it is represented in the young German Wild Boar (Nathusius, *l. c.* Taf. iii. 12). Lacrymo-frontal ridge is slightly convex.

Height of lacrymal 0·75 in.; malar border 0·5 in.

III. *Sus verrucosus*, var. *ceramica*.

Brit. Mus. 712 d. "Skull, adult. A Wild Boar from Ceram. Collected by Mr. Wallace." Of this skull I have noted that its third molar is comparatively simple, whereas the other specimens of *Sus verrucosus* in the British Museum have it complex. All the other specimens of *Sus verrucosus* catalogued p. 330, Catalogue 1869, as *Sus verrucosus*, with the exception of no. 1362 d, which was received from Mr. Wallace as *Sus vittatus*, have been noted by me as having the lacrymal long in relation to its height, and as having complex molars. As, however, Nathusius, *l. c.* p. 179, has noted the lacrymal to be short in a specimen obtained by him from Java, and as, of two skulls figured by Solomon Müller (Verhandel. tab. 32. figs. 2 and 4), one has the lacrymal short and the other long, it is clear that this species varies

in this matter. The closely allied species *Sus celebensis* cannot be said quite certainly, from Müller's pl. 28 bis, fig. 3, to have, or not to have, the long lacrymal usually found in the pigs with facial warts.

Height of lacrymal 1.0 in.; malar border 0.75 in.

IV. *Sus barbatus*, BORNEO.

Skull of *Sus barbatus*. 1519 d, Oxford University Museum. Figured Plate XLIII. fig. 7.

Height of lacrymal 1.2 in.; malar border 1.2 in.

Skull of *Sus barbatus*. Procured in Borneo by the Rev. C. Spencer Bubb.

Height of lacrymal 1.2 in.; malar border 1.2.

Skull of *Sus barbatus*. Brit. Mus. 712 a; called *Euhys barbatus*, Hand-list, p. 58, 1873.

Height of lacrymal 1.15 in.; malar border 1 in.

In *Sus barbatus* the lacrymo-frontal ridge is not very prominent, though recognizable; in the shortness of the lacrymal, which is a constant character in this species, so far as recorded in S. Müller's figures and elsewhere, and in the characters of the naso-frontal suture, it resembles *Sus cristatus* and its allies rather than *Sus scrofa*.

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POSTSCRIPT, March 22, 1877.

SINCE the publication of an abstract of the foregoing paper in 'Nature' for July 20, 1876, I have been enabled to compare the undermentioned skulls and figures of *Suidæ*, and to consult the undermentioned volumes and memoirs which had not previously been accessible to me. I have also been favoured with valuable information by the letters of a number of scientific correspondents named below. The information thus gained, in addition to that upon which my paper was based, has been in the main confirmatory of the views I had come to independently of it; the very important fact, however, that the young of *Sus celebensis* are striped, as communicated to me by Dr. A. B. Meyer, of the Royal Zoological Museum at Dresden, is directly contradictory of the suggestion which I threw out at p. 267, as is also the fact published by him as to the striping of the young of the nearly allied *S. verrucosus* directly contradictory of the statement of Müller and Schlegel given above, p. 266.

List of Sources of Information on Suidæ made available to me since July 1876.

- I. A skull of *S. celebensis* ♀, kindly lent me by Dr. A. B. Meyer, Director of the Royal Zoological Museum at Dresden.
- II. A skull of a *Sus*, sp.?, ♀, from Ternate; also lent me by Dr. A. B. Meyer.
- III. Two skulls of the Domestic Pig of Bengal (*S. cristatus*, var. *domesticus*), presented to the Oxford University Museum by E. Lockwood, Esq., Monghyr, Bengal.
- IV. Two skulls of *S. scrofa*, var. *ferus*, presented by Dr. Fiedler, of Dresden.
- V. A skull of *S. scrofa*, var. *ferus*, presented by M. le Marquis de l'Aigle, Château de Compiègne, Pise, France.
- VI. A skull of *S. scrofa*, var. *domesticus*, from Stene i Bö, Lofoten Islands, 2° above Arctic Circle; presented by H. N. Moseley, Esq., Fellow of Exeter College, Oxford.
- VII. Two bronze statuettes of *S. scrofa*, var. *ferus*, from the Gallo-Roman period in France; presented by John Evans, Esq., F.R.S.

- VIII. A Memoir by Prof. L. Rütimeyer, "Neue Beiträge zur Kenntniss des Torfsehweins," in the 'Verhandlungen der naturforschenden Gesellschaft in Basel,' iv. 1, 1864, pp. 132-186.
- IX. The Inaugural Dissertation "Zur Kenntniss des Torfsehweins," by Johann Wilhelm Schutz, Berlin, May 4, 1868, referred to by Mr. Darwin in 'Animals and Plants under Domestication,' vol. i. p. 71, ed. 2nd, 1875.
- X. A memoir by Prof. R. Hartmann on the "Verbreitung der in nordöstlichen Afrika wild lebenden Säugethiere," in the 'Zeitschrift für Erdkunde zur Berlin,' Bd. iii. 1868, in which (at pp. 349-352) there is an account of *S. sennaariensis*, which the Professor and Dr. Schutz consider to be the parent stock of *S. scrofa*, var. *palustris*.
- XI. Letter from Dr. A. B. Meyer, of the Royal Zoological Museum, Dresden.
- XII. Letter from Professor R. Hartmann, of Berlin.
- XIII. Letter from Professor Fitzinger, of Vienna.
- XIV. Letter and drawing from Professor Busk, of London.
- XV. Letter from the Rev. C. Spencer Bubb, late Missionary in Borneo.
- XVI. Letter from G. Dobson, Esq., B.A., M.B., F.L.S.

A comparison of the skull of the old male of *S. celebensis* lent me by Dr. A. B. Meyer, and the measurements of it given below, with the skulls of *S. andamanensis* and with the descriptions of the skull of *S. verrucosus* given by Nathusius, Rütimeyer, and Müller and Schlegel, will show that while agreeing with these skulls in general contour and proportions it is intermediate between them in actual size. The highest point in the sagittal contour is, as in the *Suidæ* above named, a little way anterior to the upper edge of the occipital squama; the transverse arc from one orbital process of the frontal to the other is even more convex than in any other Asiatic Pig; the zygomatic arch is short, deep, and roughly sculptured; the lower canine's alveolus reaches back to a prominent external protuberance in the plane of the anterior lobe of the third molar, a point further backwards than it usually attains to. The posterior lobes of the third molars, though consisting of 4-5 cusps, have not the great antero-posterior length relatively to the rest of the tooth which we find in specimens of the same sex of *S. cristatus*.

As in *S. verrucosus*, the bony palate is nearer to the basiscranial bones than in most other *Suidæ*.

Its measurements (being those adopted by Professor Rütimeyer, 'Verhandlungen Gesellschaft Basel,' 1864, p. 163, from Nathusius, 'Abbildungen von Schweineschädeln,' 1864, p. 6) are as follows:—

Measurement of Skull of Sus celebensis.

	millim.	=	inches.
Length from foramen magnum to tip of intermaxillaries	281	=	10·3
Length of occipital crest to tip of intermaxillaries	325	=	12·8
Length from occipital crest to tip of nasals	320	=	12·55
Length of nasals	154	=	6·1
Anterior part of frontal and sagittal sutures	56	=	2·2

	millim.	=	inches.
Posterior part of frontal and sagittal suture	97	=	3·8
From occipital foramen to vomer	47	=	1·7
From occipital foramen to palate	72	=	2·85
Dentigerous part of maxilla.....	120	=	4·7
Incisive part of palate	61	=	2·4
Greatest interzygomatic width.....	140	=	5·5
Greatest frontal width	88	=	3·5
Smallest facial width.....	31	=	1·2
Intermaxillary width	37	=	1·45
Least nasal width.....	24	=	1·95
Internolar width	43	=	1·7
Interpremolar width.....	41	=	1·6
Occipital height	112	=	4·7

	millim.	=	compare	in	<i>Sus verrucosus</i> , Rütim.
Lacrymal orbital border	22	=	·9	compare	1
Lacrymal malar border.....	17	=	·7	„	1·13
Lacrymal upper border	31	=	1·4	„	1·84

	millim.	=	
Length of <i>S. celebensis</i> , sec. Dr. A. B. Meyer.....	1160	=	45·67
„ „ Müller & Sehlegel	950	=	37·40
Length of tail of <i>S. celebensis</i> , sec. Dr. A. B. Meyer.....	250	=	9·84
„ „ Müll. & Schlegel.....	150	=	59
Height of <i>S. celebensis</i> , sec. Dr. A. B. Meyer	550-570	=	21-22
„ „ Müller & Sehlegel	560	=	22

Dr. A. B. Meyer's specimen was more brown than Müller's and Sehlegel's figure, pl. 28 *bis*; the tuft at the angle of the mouth red-brown, and the hair on the nape longer. As to his measurements of *S. celebensis*, Dr. A. B. Meyer observes that they are taken from a full-grown animal, and, being larger than those of Müller and Sehlegel, bring *S. celebensis* more nearly on to a level with *S. verrucosus*. Its smaller size suggests the dwarfing action of a confined insular *habitat* undergone in some of the upheavals or subsidences of Celebes.

Dr. A. B. Meyer informs me that the young of *S. celebensis* are striped, in contradiction to the suggestion which I (see p. 267, *suprà*), being impressed with the closeness of the affinity between this *Sus* and *S. verrucosus* (which Müller and Sehlegel had declared not to be striped when young), had thrown out. He informs me also that he has the authority of General von Schierbrant, who has lived thirty years in Java and is a first-rate sportsman, for saying that Müller and Sehlegel (*l. c.* p. 177) are not correct in what they say is the case with *S. verrucosus*. If this be so, the claim which *S. verrucosus* would have had to be considered the parent stock of our improved breed of pigs falls to the ground. On the other hand, I cannot, knowing the great modificatory power which domesticating influences of one kind or other have been proved to possess over the highly plastic porcine organism, and bearing in mind the similarity between the Irish Greyhound, Pig, and *S. verrucosus*, agree with Professor Rüttimeyer (p. 184, *l. c.* 1864) in excluding this *Sus* from consideration when we are speculating as to the parentage of our domestic Pigs.

The skull of the *Sus* from Ternate lent me by Dr. A. B. Meyer belonged to a young male, the third molars of which were just coming into place, and which may be supposed therefore, according to the analogy of *S. scrofa*, var. *domesticus*, if that may be taken as any guide, to have been about eighteen months old (see Nathusius, *l. c.* p. 21). It differs from skulls of *S. cristatus* in the flatness of its lacrymo-frontal ridge, in the convexity backwards of its naso-frontal suture, and in being somewhat smaller than male skulls of that variety of *Sus* usually are. The posterior lobes of its third molars are not quite so large as they usually are in *S. cristatus*; but to this point I am not inclined to assign as much importance as some other writers do (see Rütimeyer, 'Fauna der Pfahlbauten,' pp. 33 and 188, and, *per contra*, Nathusius, *l. c.* pp. 49 and 103). In the straightness of its vertical contour it contrasts with *S. celebensis*, *S. andamanensis*, *S. vittatus*, as figured by Müller and Schlegel, *l. c.* plate 32. fig. 6, and with *S. barbatus* as figured here, Plate XLIII. fig. 7; and resembles *S. cristatus*, as it does also in its general faeies. Dr. A. B. Meyer thinks that this *Sus* may possibly deserve to be considered a new species, *S. ternatensis*; but having had abundant experience of the facility with which the wild pigs of that region cross considerable arms of the sea, he would, I gather, express himself with much caution as to its relations to *S. papuensis* and the Suidæ of the neighbouring islands, volcanic and other, tenanted by swine. The colouring, however, of the head of this *Sus* differs from that of any other *Sus* seen by Dr. A. B. Meyer, or figured by Schlegel—the head being covered all over with long black hair, except in the region occupied by a broad yellowish brown streak beginning between the eyes and descending to the snout, where it broadens.

Measurements of skull of Sus ternatensis.

	millims.*	inches.
Length from foramen magnum to tip of intermaxillaries	290 =	11·4
„ occipital squama „ „ 	355 =	14·1
„ „ tip of nasals 	345 =	13·5
Length of nasals	17 =	16·7
Anterior part of line of frontal and sagittal sutures	86 =	3·2
Posterior part of same line	95 =	3·7
Molar length.....	143 =	5·65
Ineasive bone length	57 =	2·2
Greatest interzygomatic width	137 =	5·65
Greatest faeial width.....	95 =	3·8
Least faeial width.....	36 =	1·45
Intermaxillary width	40 =	1·6
Least nasal width.....	28 =	1·1
Intermolar width	49 =	1·9
Interpremolar width.....	44 =	1·75
Ooeipital height.....	111 =	4·4
Laerymal orbital border	25 =	1
„ malar border	20 =	·8
„ upper border	34 =	1·3

A comparison of the two skulls of the domestic Pig of Monghyr, Bengal, which I owe to the kindness of E. Lockwood, Esq., and which, he informs me, are kept in large numbers

by the pariah castes of his district, feed on human ordure, and are sold out of the district to the Chinamen at Calcutta, with the skulls of the wild Pig of Hindostan (*S. cristatus*) shows that they differ from them in little else than their smaller size. They may be spoken of, therefore, as *S. cristatus*, var. *domesticus*; and they are as distinguishable from any variety of *S. scrofa*, var. *domesticus*, or indeed of *S. indicus*, as is the wild *S. cristatus* from other wild Suidæ.

It is noteworthy that one of the skulls belonged to a very old sow. In these, as in the days when Juvenal spoke (Sat. vi. 160), of another eastern country as a place where

“Vetus indulget senibus clementia porcis,”

it is a rare thing for a domestic Pig to be allowed among western nations to live long enough to wear down its third molars. Mr. H. N. Moseley, however, informs me that domestic Pigs are kept in the Chinese Buddhist monasteries till they die of old age and infirmities; and of India, Meiners, in his ‘Allgemeine kritische Geschichte der Religionen,’ 1806, Bd. i. p. 193, says, “In Asien war von jeher Hindostan, wie in Afrika, Egypten, der Thron des Thierdienstes.”

It is noteworthy, secondly, that with the worn-down molars of this aged domesticated Pig were correlated abscesses on both sides of the lower jaw, much as might have been the case (see J. R. Mummery, Esq., Trans. Odont. Soc. ii. 2, 1869, p. 72) in ill-fed human beings with similarly worn-down teeth.

Mr. Lockwood informs me that the young of the domestic Pigs of his district are striped like the young of wild Pigs.

The skull of a wild boar, from France, presented by the Marquis de l'Aigle, shows that the posterior lobe of the third molar in the lower jaw may attain the same proportions in *S. scrofa*, var. *ferus*, that it does in *S. cristatus*.

The skull of *S. scrofa*, var. *domesticus*, procured for me by H. N. Moseley, Esq., from the Lofoten Islands, two degrees within the Arctic circle, has the long, low, lacrymal characteristic of *S. scrofa*, var. *ferus*, a fact of particular interest when coupled with the information, also procured for me by him, to the effect that the young domestic pigs of that region are occasionally born with stripes, and with his observation that the old pigs have a very wild-boar-like appearance. These facts should be borne in mind as telling against the views propounded by M. André Sanson, in his memoir “Sur la prétendue transformation du Sanglier en Cochon domestique,” in the ‘Journal de l'Anatomie et de la Physiologie,’ tom. iv. 1867, p. 38.

In Professor Hartmann's memoir above referred to, it is stated (p. 350) that certain Negro tribes, who disobey Mahommedan precepts by eating as well as domesticating *S. sennaariensis*, excuse themselves by saying it was formerly the custom to do so, a fact which goes some little way to disprove the view that this true *Sus* can be merely a feral variety of *S. scrofa*, imported by Europeans. Professor Hartmann, in a letter of date Sept. 28, 1876, says, “*Sus sennaariensis* ist ein kleines dem europäischen Torfschwein (der Pfahlbauten) ähnliches Schwein, echtes *Sus*, welches wild durch einen grossen Theil von Mittel-Afrika vorzukommen scheint . . . *Sus scrofa ferus* in der Sahara und in Ägypten nicht selten, findet sich angeblich ebenfalls in Sennaar, indess weiss ich hierüber nichts völlig Sicheres.”

Professor Busk, in a letter to me of Dec. 17, 1876, informs me that in the Etruscan Museum at Florence, amongst numerous little bronze articles extracted from the ancient Etruscan tombs, there were many figures of animals, one in particular being a very well made statuette of a pig, which to his eye very closely resembles the Berkshire breed, the only point in which it differed being the comparatively large eye, whilst the rest of the contour was quite what we might expect to see at an ordinary cattle-show. The animal was represented apparently as having a close curled tail. With it were a good many statuettes of stags, the horns of which were of the type of the pliocene *Cervus stenoceros*. In the very perfectly restored Etruscan tomb erected in the Museum, with all its original contents and frescoes, Professor Busk noticed, amongst other figures of animals, one very well drawn of a monkey climbing up a tree or pole.

I should suggest that the monkey and the pig, both alike, are representations of animals from the same quarter of the globe as that whence the kinsmen of the Etruscans in the time of Solomon brought, every three years, into Mediterranean regions, the ivory, apes, and peacocks, the Sanskrit names of which still remain to speak to their *habitat*. See Max Müller, 'Lectures on the Science of Language,' 1861, ser. i. p. 190, and ser. ii. p. 234, for the source whence these animals and copper came to Europe.

Professor Busk sent me by the same post odontograms of the teeth of *S. cristatus*, *S. scrofa*, var. *ferus*, and *S. scrofa*, var. *domesticus*, which show that in *S. cristatus* the antero-posterior length of the third molars is much greater in relation to that of the rest of the molar series than it is in either of the other *Suidæ* named. I have above, p. 262, noted that the sexual differences in this matter are very considerable in *S. cristatus*; and those produced by domestication are also not insignificant—points which somewhat impair the value of these statements of relative proportions, though no less an authority than Rütimeyer avers, 'Fauna der Pfahlbauten,' p. 188, that "*mit viel grösserer Zähigkeit das Gebiss den Species-Typus ausseren Einflüssen gegenüber aufrecht halt als die Schädelbildung*" (cf. however, Nathusius, *l. c.* pp. 49, 103, and Studer, *Mittheil. Ant. Gesell. Zürich*, xix. 3, 1876, p. 67). Professor Busk also observes that in *S. cristatus* nearly all the teeth, except molar 3, are wider in both jaws in proportion to their length than they are in the other two, and that from this we may suppose that the Indian pig is more exclusively herbivorous than the tame or wild animals with which he has compared it. Jerdon speaks of *S. cristatus*, *l. c.* p. 243, as being in general almost entirely "vegetable feeders." Captain Baldwin's views ('The Game of India,' pp. 154-5, 1876) are to the same effect.

Professor Busk's drawing and description of this Etruscan pig, coupled with a similar figure of a pig found in the ruins of Herculaneum (see Nathusius, *l. c.* p. 142, fig. 33, and Darwin, *l. c.* p. 71), furnishes a good illustration of Rütimeyer's saying (Fauna der Pfahlbauten, p. 190), that though the modern breed of domestic pigs is recent enough to have been introduced by steamboats, it nevertheless had been represented continuously from former ages by the Bündtner-Schwein in the valleys of the Grisons. A figure of a sow suckling three young ones may be seen on an Umbrian medal of probably the third century B.C. at latest, figured by M. Sambon, in his 'Monnaies Antiques de l'Italie,' 1870, pl. v. 5, with the short snout bent on the chanfrin, the

pendent ears, and the mane limited to the nuchal region, which justify us in considering it to have been intended to represent a tame variety. A pig, figured *ibidem*, pl. iv. 4, from Etruria has a snout of such slenderness as to correspond very closely with the description given of *S. scrofa*, var. *palustris*, whilst it contrasts in other points very strikingly with the wild boars represented from Apuleia and Lucania, on the other side of Italy (*ibidem*, plates xiv. 1, xv. 17 and 37, xix. 4), which have as close a zoological as legendary connexion with the wild boar of Calydon, on the other side of the Adriatic (see 'Thesaurus,' Brandenburg, i. pp. 318 & 464, 1696, and 'Thesaurus Numismaticus,' i. p. 400, and tab. xl.).

Of the two bronze statuettes given me by Mr. John Evans, one has the long slender snout, and the mane reaching the whole length of the convex back, from the prominent ears to the curled tail, which may justify us in considering it as intended for a wild boar; the other combines the sturdy straddle and the long and large erect mane, beginning on the forehead and in front of the erect ears, characteristic of a wild boar, with a snout as disproportionately short, and tusks as reduced as we ever see them in the highest-bred modern Chinese pig. The characters of the wild and tame varieties, however, being thus inaccurately and inartistically combined in these statuettes, causes them to contrast disadvantageously with the Italian works of art just mentioned; but they furnish us with a conclusive answer to the weak reasoning of De Blainville ('Ostéographie,' Sus, p. 170), expressed in the following words:—"Du temps de César, il paraît cependant qu'elle (la culture du cochon) n'était pas encore parvenue dans les Gaules, car il n'est nullement question de cet animal dans ses Commentaires; elle s'y est donc propagée depuis la conquête, d'où elle a passé en Angleterre, qui ne possédait pas même de sanglier dans ses forêts!" If further answer were required to this astounding statement, a reference to Mr. Evans's work on British Coinage would furnish it—figures of the boar, some of which are exceedingly characteristic, being given there on pls. vi., viii., xi., xii., and xiii., from those ancient coins. But all well-informed antiquaries are aware that the wild boar is one of the earliest animals figured in Celtic works of art (see 'Horæ Ferales,' p. 185, pl. xiv.; Montellier, 'Mémoires sur les Bronzes Antiques,' Paris, 1865; and Stephens, 'Literature of Kymry,' p. 250).

Professor Rüttimeyer's paper in the 'Verhandlungen der naturforschenden Gesellschaft in Basel,' iv. 1, 1864, is, I apprehend, referred to by Mr. Darwin when he says ('Animals and Plants under Domestication,' i. p. 71, 2nd ed. 1875) that "Rüttimeyer himself seems now to feel some doubt" as to whether the "Torfschwein" existed as a wild animal during the first of the stone period. No reference is given *l. c.* to any memoir of Professor Rüttimeyer's; and I became, after writing the foregoing paper, acquainted with the one in question from a mention of it made by Herr Edmund Naumann in 'Archiv für Anthropologie,' Bd. viii. 1, 1875, p. 19, in a discussion on "Die Fauna der Pfahlbauten im Starnberger See." From a perusal of this paper of Professor Rüttimeyer, I am inclined to think that he would regard the skull which I have figured (Plate XLI. fig. 2) as a skull of *S. scrofa*, var. *palustris*. I have spoken of it as the skull of a wild sow, considering, as said above, p. 259, that early breeding may, in a species admitting of such a wide range of structural oscillation, and notably in the matter of mere size, account for a very great distance be-

tween its male and female representatives (see for similar view as regards our own species 'Journal of Anthropological Institute,' vol. ii. 1875, p. 122). I am not inclined to withdraw from this view even after reading Prof. Rüttimeyer's and Herr J.W. Sechutz's memoirs. For in the former of these I find (p. 151) that the *five* skulls used for description are acknowledged to be skulls of sows, and four of them to have been skulls of *old* sows, and the measurements given at p. 163 have been taken exclusively from skulls confessedly female (see p. 161). And I learn from Herr Sechutz's essay (p. 44) that Steenstrup (*cit.*, Wiegmann's Archiv, xxvii. n. 112) had distinctly stated that the "Torfschwein" was (as I had hinted without any knowledge of his views, see p. 254, *suprà*) simply the female representative of *S. scrofa*, var. *ferus*. Professor Rüttimeyer had not at the time of writing his 'Fauna der Pfahlbauten,' 1861 (see p. 33), a single perfect skull of the "Torfschwein" available to his comparison; the almost perfect skulls treated of in his memoir of 1864 (see p. 150) have caused him to modify the view put forward at p. 190 of the earlier work, and in the later one he allows (pp. 158-160) that, both in the matter of the length of the lacrymal and in the absence of widening of the palate anteriorly, the *S. scrofa*, var. *palustris*, was more nearly affined to *S. scrofa*, var. *ferus*, than to *S. indicus*. To show this was the reason for giving a great number of my measurements, *suprà*, pp. 269-272. I take this opportunity of saying that the very small breed of the Scottish highlands and islands, with suberect ears, usually of a dusky brown colour, with an arched back and coarse bristles along the neck and spine, spoken of by Professor Low in his 'Domesticated Animals of the British Islands,' p. 429, may perhaps be such a breed as Professor Rüttimeyer suggests, in his later paper (p. 168, see also p. 148), should be looked for in Eastern Europe or Western Asia or in fossil forms*.

Mr. G. E. Dobson, F.L.S., in a letter to me of date Jan. 15, 1877, informs me that the young of the Pig of the Andaman and of the Nicobar Islands are striped.

The Rev. C. Spenceer Bubb informs me that the young Borneo domestic Pig is sometimes striped and sometimes not, whilst the young Chinese Pig is never striped; and he adds that there are certainly two domestic breeds in Borneo.

* I suspect that latitude has more to do with the production of such varieties than longitude, and still operating causes more than geological. One of these causes is suggested by the words of Varro, ii. 4. 13, cited by Durcau de la Malle, 'Economie politique des Romains,' ii. p. 149: "Porcique nati hieme, fiunt exiles propter frigora."

DESCRIPTION OF THE PLATES.

PLATE XLI.

Fig. 1. Side view of partially reconstructed skull of *Sus scrofa*, var. *domesticus*, wanting nasals and intermaxillaries, from late Celtic interment at Arras, East Riding of Yorkshire. Oxford Museum.

It is, as Nathusius has well pointed out, *l. c.* p. 147, by no means always easy to be absolutely certain as to the question whether a particular pig's skull belonged to a wild or to a domesticated individual. The difficulty is increased when the animal is young, as in this case, the last molar having only just come into use, and the animal consequently being only about 18 months old, and when as the small size generally, and especially the small size of the third molar and the canine, may be taken, I believe, to indicate that it is of the female sex. It is true that the paucity of cusps in the molars has been taken as indicating the wild state; a comparison, however, of the male and female molar series in *Sus cristatus* has suggested to me that the greater size of the molars really depends upon a greater supply of blood, such as the male molars would get, by virtue of sharing the greater supply lavished on the canines, and such as a well-fed domesticated animal's molars would get in common with all its other structures and organs. The comparatively vertical occipital squama is one main anatomical point in favour of this skull having belonged to a domesticated specimen; the pterygoid, on the other hand, has much of the obliquity characteristic of the wild *Sus scrofa*, var. *ferus*. When we consider, however, that this skull was found in an interment containing a human body, together with portions of another skull of a pig of the same age, the probability that it belonged to a tame individual appears to be very great. The subjoining measurements show that the lacrymal bone, though not so long relatively to its height as is often the case in the non-domesticated *Sus scrofa*, is yet longer than it is in *Sus indicus*, or in any of the Eastern pigs from which *Sus indicus* can with any probability be supposed to have descended.

	inches.
Length from anterior external angle (apex) of frontal to middle of occipital ridge	5·9
Length from apex of frontal to apex of maxilla	4·1
Length from anterior border of orbit to temporal ridge	3·8
Length from anterior border of orbit to posterior	1·4
Greatest width of occiput	2·4
Length of molar series	2·3
Height of occiput	3·8
Height of lacrymal	0·7
Length of lacrymo-malar suture	0·8

The difference here noted between the height of the lacrymal and the length of its lower border amounts but to a tenth of an inch; but in the female of *Sus indicus*, with the same stage of dentition, Pl. XLII. fig. 4, the height of the lacrymal, instead of being one tenth of an inch less, is 0·35 inch greater in length than its lacrymo-malar border.

Fig. 2. Skull of *Sus scrofa*, var. *ferus*, old ♀, from alluvium of Thames valley, obtained for the Oxford University Museum from the cutting for the drainage works near Iffley, 1876, by Professor Prestwich, F.R.S.

This skull combines the general contour and the slender snout of *Sus scrofa*, var. *ferus*, with a lacrymal bone differing little in its proportions from the lacrymals so characteristic of the Asiatic pigs, less *Sus verrucosus* (and *celebensis*). The fronto-parietal region does not form one

continuous slope in the same plane as is the case in the Wild Boar of Germany (Pl. XLII. fig. 5); but this difference may be observed in skulls certainly of Wild Boars from the Thames-valley deposits; whilst the great wear of the teeth (see p. 258, note * above) and the slenderness and length of the naso-facial region are much in favour of considering this specimen to have belonged to the wild race. I have placed side by side with the measurements of this skull the measurements given by Rütimeyer, *l. c.* pp. 45 and 183, of his "Torfschwein," *Sus scrofa*, var. *palustris*. Unhappily, Rütimeyer has never been able to procure (see pp. 43 and 45, note 1) a skull of this variety of *Sus* with the facial bones in connexion with the brain-case, nor has Nathusius (see p. 149, *l. c.*) ever been able to see an uninjured lacrymal bone from the same animal. These facts, whilst making the value of this skull (the opportunity of figuring which I owe to the kindness of Professor Prestwich) greater, make the value of the comparison of its measurements less.

The instructive observations of Nathusius (*l. c.* pp. 99–101), to the effect that ill-nourished pigs have the entire length of their skulls greater as measured from the occipital crest to the apex of the snout, whilst the portion of that length made up by the frontal and parietal is somewhat shorter, and the nasal portion proportionally longer, when coupled with the fact of the great wear of the teeth in this specimen, enable us to explain the one great point of inferiority, that of the length of the fronto-parietal region, which this skull's measurements show us, compared with those of the "Torfschwein." It may be added, that the true explanation of Dr. Gray's statement (Brit. Mus. Catal. 1869, p. 329), that the nasal bones of the skull elongate as *Suidæ* increase in age, "and especially as they reach adult and old age," is probably that he had in his mind's eye skulls of old and ill-fed wild pigs, such as this specimen. On the other hand, when we are comparing such skulls as this with the "Torfschwein" of Rütimeyer, we must recollect that he represents this latter variety of pig, and what he supposes to be its still surviving representative, the "Bündtner-Schwein," as having a short snout (see pp. 42, 45, 181–185). The classificatory value, however, of such a peculiarity is much reduced by the results of such experiments as those of Nathusius just referred to.

Measurements of Ifley Skull and of Rütimeyer's "Torfschwein," pp. 45, 183, l. c.

	Ifley Skull. inches.	Torfschwein. inches.
Greatest frontal width between cetrobital processes	3·2	3·7
Least width on vertex	0·8	0·9
Greatest interzygomatic width	4·6	4·7–4·9
Height of occipital from inferior border of foramen magnum . . .	3·5	3·8–4·5
Length of vertex from level of supraorbital foramen to ridge of occiput	3·8	4·4
Horizontal distance from anterior border of orbit to posterior of temporal fossa	3·0	3·1
Length of intermaxillary along alveolar border	2·1	1·9–2·4
Maximum length of skull from apex of intermaxillaries	10·9	—
Length of nasal bones (approximately)	5·5	—
Length from apex of intermaxillaries to inferior border of foramen magnum	10·3	—
Length from anterior external angle (apex) of frontal to middle of occipital ridge	5·9	—
Length from middle of fronto-nasal suture to middle of occipital ridge	4·8	—

	Iffley Skull. inches.	Torfschwein. inches.
Length from anterior border of orbit to posterior	1·4	—
Greatest width of occiput	2·4	—
Breadth of nasal at commencement of naso-frontal suture, which is point of maximum width of nasals	1·1	—
Maximum width of intermaxillaries	1·3	—
Height of lacrymal along rim of orbit	17 millims.	
Length of lacrymal along malar suture	18 millims.	

Fig. 3. *Sus andamanensis*. 1514*b*, Oxford University Museum, adult ♀.

The skull from which this drawing was taken was that of a Wild Sow from the Andaman Islands, procured for me by my friend J. Wood-Mason, F.G.S., of the Calcutta Museum. It is about the same size as the two prehistoric British skulls, figured figs. 1 and 2, and as the "Torfschwein" of Rütimeyer—resembling this latter in the one important particular, that of its long fronto-parietal region, in which it differs from the British skull (fig. 2). It differs from all the pigs' skulls here figured in the exaggeratedly disproportionate shortness of the malar border of its lacrymal bone, which is, as in the newly born European pig, little more than half the length of the orbital border. In its convex frontal region we have, again, a character retained in the adult Asiatic which is transitorily represented in the European pig. This convexity of the fronto-lacrymal ridge is well marked and, like the straight naso-frontal suture and the two other peculiarities specified, serves to differentiate *Sus andamanensis* from specimens of similar size from the Palearctic region, and to show that it is a member of the group represented by *Sus cristatus*. Again, this skull resembles *Sus cristatus* and differs from *Sus scrofa* in being somewhat shorter, and having the paroccipitals, temporal bullæ, and pterygoid processes more crowded together. The length of the nasals is a little less than that of the fronto-parietal region in the vertical aspect, as is often, though not always, the case in *Sus cristatus*, though very rarely, if ever, in *Sus scrofa*.

Measurements of Skull of Sus andamanensis, female.

	inches.
Greatest frontal width between ectorbital processes	3·3
Least width on vertex	0·8
Greatest interzygomatic width	4·65
Height of occiput from inferior border of foramen magnum	3·7
Length of vertex from level of supraorbital foramina to middle of occipital ridge	4·5
Horizontal distance from anterior border of orbit to temporal ridge	3·05
Length of intermaxillary along alveolar border	2·0
Maximum length of skull from apex of intermaxillaries	10·8
Length of nasals	5
Length from apex of intermaxillaries to anterior edge of foramen magnum	9·1
Length from apex of frontal to middle of occipital ridge	5·95
Length from middle of fronto-nasal suture to middle of occipital ridge	5·5
Length from anterior border of orbit to posterior	1·5
Greatest width of occiput	2·5
Breadth of nasals at commencement of naso-frontal suture, which is the broadest part of nasals	1·0
Maximum width of intermaxillary region	1·2
Height of lacrymal along rim of orbit	17 mm.

Length of lacrymal along malar suture	8 mm.
Length of molar series	2·0 inches.
Length of premolar series	1·3 inch.

PLATE XLII.

Fig. 4. Skull of Wild Indian Sow, *Sus cristatus*, British Museum. See 'Catalogue of Carnivorous, Pachydermatous, and Edentate Mammalia,' 1869, p. 334 (where this skull is catalogued as "716 m. Skull of young female. Length 10¼, height 7½ inches. Terai, Nepal; Dr. Oldham"), or Hand-List, published 1873, p. 64.

This skull has been figured to show the points in which it contrasts with the British pig's skull (figure 1) on the one hand, as to racial characters, and with the Indian boar's skull (figure 6) as to sexual characters, agreeing, as it does, with the one as to sex, and with the other as to age.

It is, as may be seen by constructing two triangles with the three first measurements given of it and of that of *Sus cristatus* (fig. 6) respectively, a very much smaller skull than that; the principal points, however, enumerated in the description of that skull, as differentiating it from *Sus scrofa*, can be recognized in its smaller contours. The third molar in the upper jaw has the part posterior to its second principal lobe much smaller relatively and absolutely than is the case in Boars of *Sus cristatus*; this posterior factor, however, effloresces into as many as 7 cusps in the upper and 5 in the lower jaw of this specimen.

Measurements of Skull 716 m, British Museum Collection. Sus cristatus, from Terai, Nepal.

	inches.		inches.
Extreme length	11·2	Length of lacrymal along malar suture	0·75
Extreme height	4·3	Interpremolar transverse diameter of	
Base-line	10	palate	1·6
Height of lacrymal along rim of orbit	1·1	Intermolar	1·75

Fig. 5. Skull of Wild Boar, *Sus scrofa*, var. *ferus*, from Germany. No. 1513 a, Oxford University Museum.

The entire dentition was in place; the portion of the third molar which is posterior to the four primary cones is very small as compared either with the rest of the tooth or with its homologue in the Indian Wild Boar (fig. 6). It is, however, considerably in front at a line drawn as a perpendicular to the plane of the cutting-edges of the molars from the lacrymal canal. This skull differs markedly from the skull just named in the greater length, relatively to the height, of its lacrymal bone, in the greater length of its nasals relatively to the length of the fronto-parietal region, in the absence of any great convexity in the part of the frontal abutting upon the lacrymal, and in the convexity backwards of its fronto-nasal suture.

Measurements of Skull of German Wild Boar, no. 1513 a, Oxford University Museum.

	inches.		inches.
Extreme length	16·5	Width of nasals	1·3
Extreme height	5·1	Maximum interzygomatic width . .	5·9
Base-line from anterior margin of foramen magnum to apex of intermaxillaries	14·0	Maximum frontal (interectorbital) width	4·2
Length of nasals, approximatively .	8·0	Height of lacrymal along rim of orbit	1·0
Fronto-parietal length in vertical aspect	6·8	Length of lacrymal along malar suture	1·2

PLATE XLIII.

Fig. 6. Skull of Indian Wild Boar, *Sus cristatus*, killed at Haugul, Dharwar Province, from the collection of Sir Walter Elliot, K.C.S.I. No. 72.

In this animal the third molar is only just coming into place, and its very large multicuspidate posterior lobe is not so far forward relatively as in the European Wild Boar (fig. 5) nor in other Indian hogs of greater age. It shows, however, very plainly the points, several, if not always all of which have, by their presence in every specimen of *Sus cristatus* which I have examined, enabled me to distinguish it from *Sus scrofa*, var. *ferus*. It has the relatively short lacrymal—a tape, stretched as an arc across the long axis of the skull, from the anterior inferior angle of the bone on one side to the homologous point on the other, passing over the frontals, and not over any part of the nasals; the naso-frontal suture, which lies entirely in front of such an arc, is straight, and not convex backwards; the portion of the frontal which is bounded internally by the supraorbital channel, and externally by the lacrymal bone, is markedly convex. The nasals are broader, as is nearly always the case, and shorter also, which is not by any means always the case, relatively to the fronto-parietal region of the vertex, than in *Sus scrofa*, var. *ferus*.

Measurements of Indian Wild Boar, no. 72, Sir Walter Elliot's collection.

	inches.		inches.
Extreme length	16·9	Minimum vertical width	1·8
Extreme height	5·1	Height of lacrymal along rim of orbit	1
Base-line from ant. margin of foramen magnum to apex of intermaxillaries	13	Length of lacrymal along malar suture	0·9
Length of nasals	7·3	Interpremolar transverse diameter of palate	1·6
Length of fronto-nasal suture to middle of occipital ridge	8	Intermolar	2·05
Width of nasals at apex of frontals . .	2	Length of posterior upper molar . .	1·35
Maximum interzygomatic width . .	6	Breadth	0·9
Maximum frontal (interectorbital) width	4·4	Length of third lower molar . . .	1·6
		Breadth	0·8

Fig. 7. Skull of *Sus barbatus*, Borneo. 1519 d, Oxford University Museum.

This skull, like the other three skulls of the same species examined by me (of which two are in the British Museum), differs from those already described in large points as well as in small ones; and there can be little reason for hesitating to accept it as specifically distinct from them and, indeed, from all other Suidæ.

The contour described by the middle line of its nasal and fronto-parietal regions superiorly, the relations of the greatest width and greatest lengths both of the entire skull and of the nasal bones, the position of the plane of its greatest interzygomatic width, not posteriorly, but in the middle of the zygomatic arch, are points of large difference. The exceeding simplicity of its third molars and the persistence of the mesopterygoid as a distinct bone, are points of small difference, but yet of great morphological importance. In the shortness of its lacrymal bone it resembles the other Suidæ without facial warts.

Its naso-frontal suture and lacrymo-frontal ridge are more like those of these pigs than those of *Sus scrofa*.

Measurement of Skull of Sus barbatus, 1519 d, Oxford University Museum.

	inches.		inches.
Extreme length	19·7	Maximum frontal (interectorbital)	
Height	6·7	width	4·5
Base-line	16·7	Minimum vertical	1·4
Length of nasals from plane of postero-		Lacrymo-malar line	1·2
lateral tips	10·5	Height of lacrymal	1·2
Fronto-parietal region in vertical aspect		Length of posterior upper molar . .	1·4
from same point as preceding mea-		Breadth of anterior, which is much the	
surement to occipital ridge in straight		widest lobe	0·9
line	9·0	Length of posterior lower molar . .	1·5
Width of nasals	1·5	Breadth of anterior lobe	0·8
Maximum (interzygomatic) width .	6·8	Intermolar space at narrowest point .	1·1

Fig. 8. Left lower third molar of *Sus andamanensis*, female, $2\frac{1}{2}$ times the natural size.

This tooth shows the three divisions of the third molar of the true *Suidæ* in great simplicity. There are two bicuspidate lobes corresponding to the two principal lobes of molar 1 and molar 2, and, like them, enclosing a single azygos lobe in the middle line between them. This azygos lobe is developed from the second bicuspidate lobe. There is no ridge developed in *Sus andamanensis* on the anterior part of the tooth, *i. e.* on the face in contact with molar 2. Posteriorly to two bicuspidate lobes, which already show signs of wear, are seen five smaller cusps, occupying in all a much smaller space than the rest of the tooth. In the males of *Sus cristatus* these five smaller cusps would, as in well-fed domestic pigs, occupy a very much larger space relatively and absolutely than they do here, or even in *Sus scrofa*, var. *ferus*. In *Sus barbatus* the third lower molars are as simple as they are in *Sus andamanensis*, and, like this *Sus*, have the third molars of the upper jaw simpler still than the lower. The five posterior cusps consist of one placed mesially in the interspace between the primary cusps of the second pair, of three placed like the dots in the sign '··', and of a fifth, not constant, accessory cusp placed on the inner side. The four latter are represented in the upper jaw of this pig by two, and in *Sus barbatus* by one main cusp.

2/5

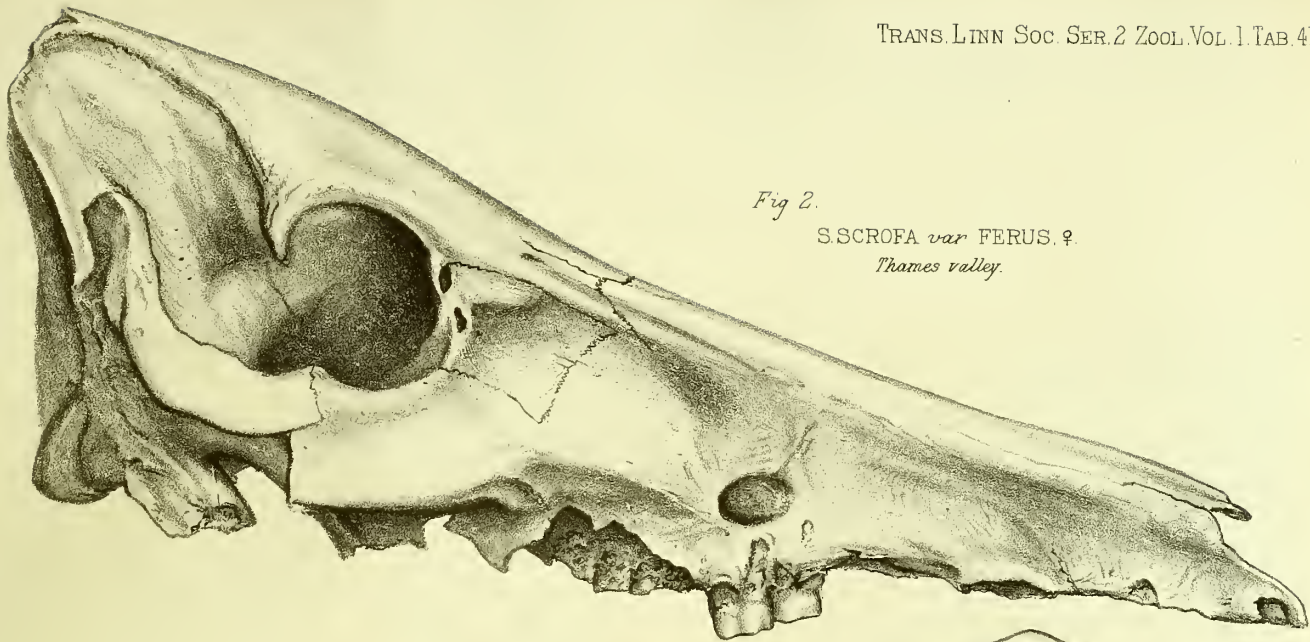


Fig 2.
S. SCROFA var FERUS. ♀
Thames valley.

2/5

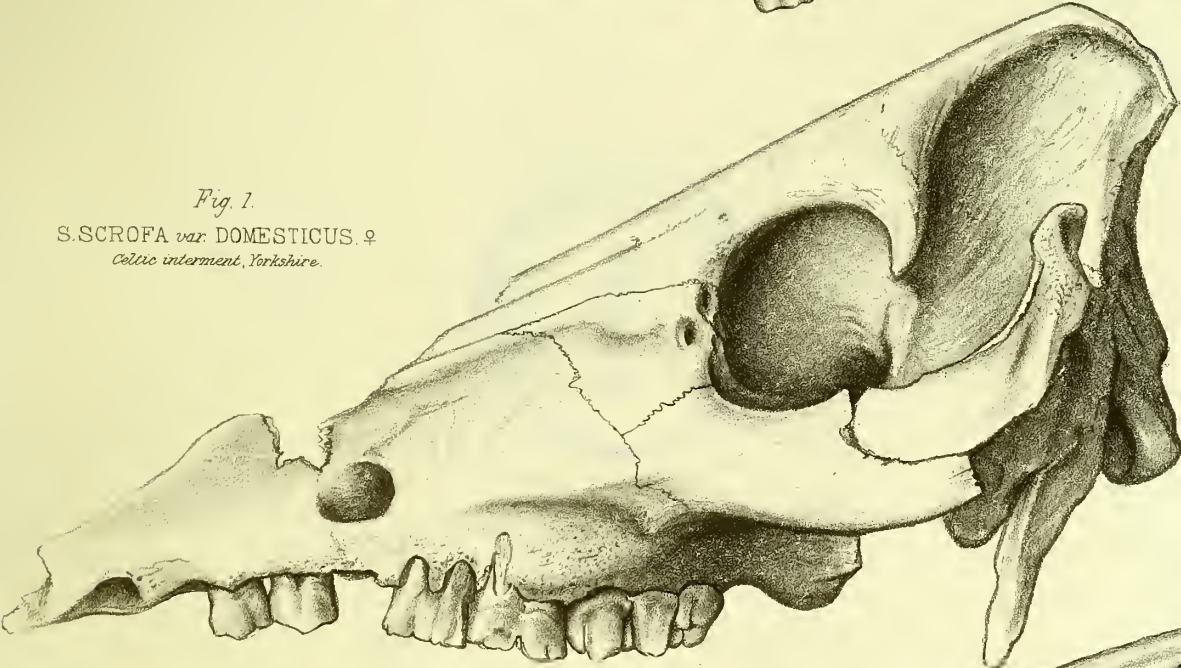


Fig. 1.
S. SCROFA var DOMESTICUS. ♀
Celtic interment, Yorkshire.

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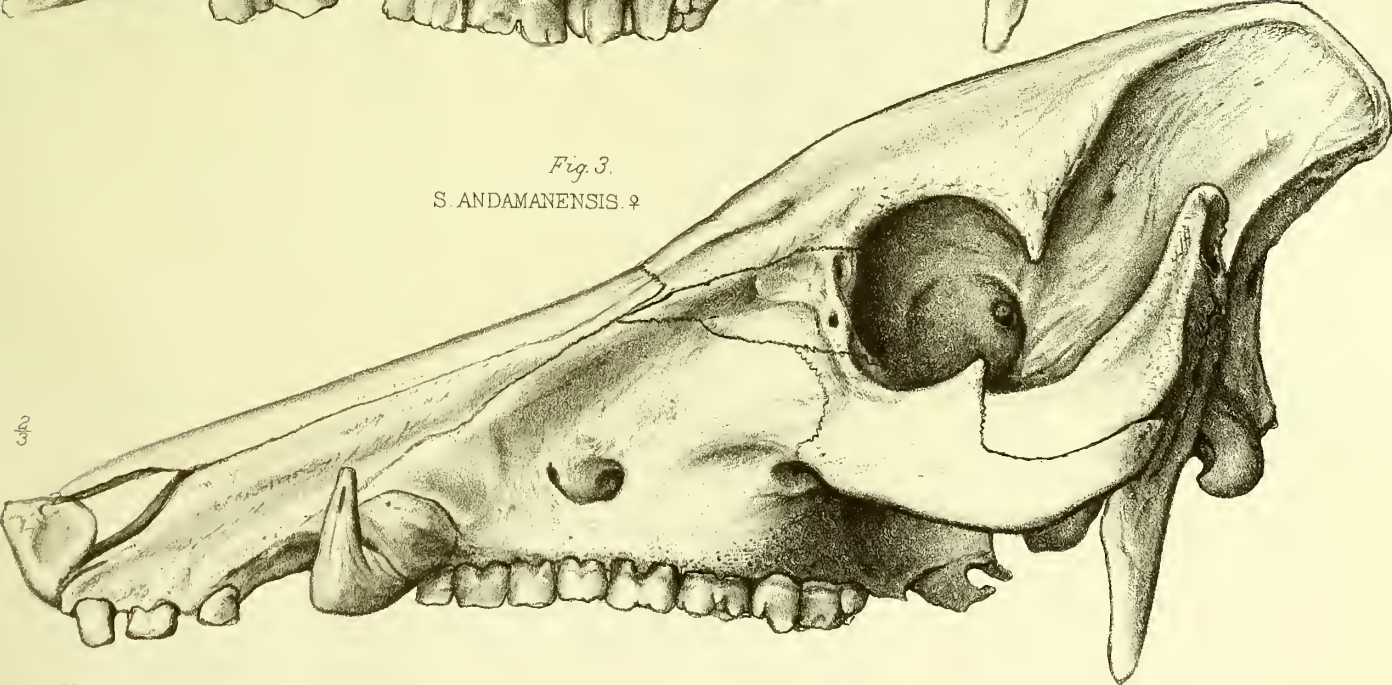


Fig 3.
S. ANDAMANENSIS. ♀



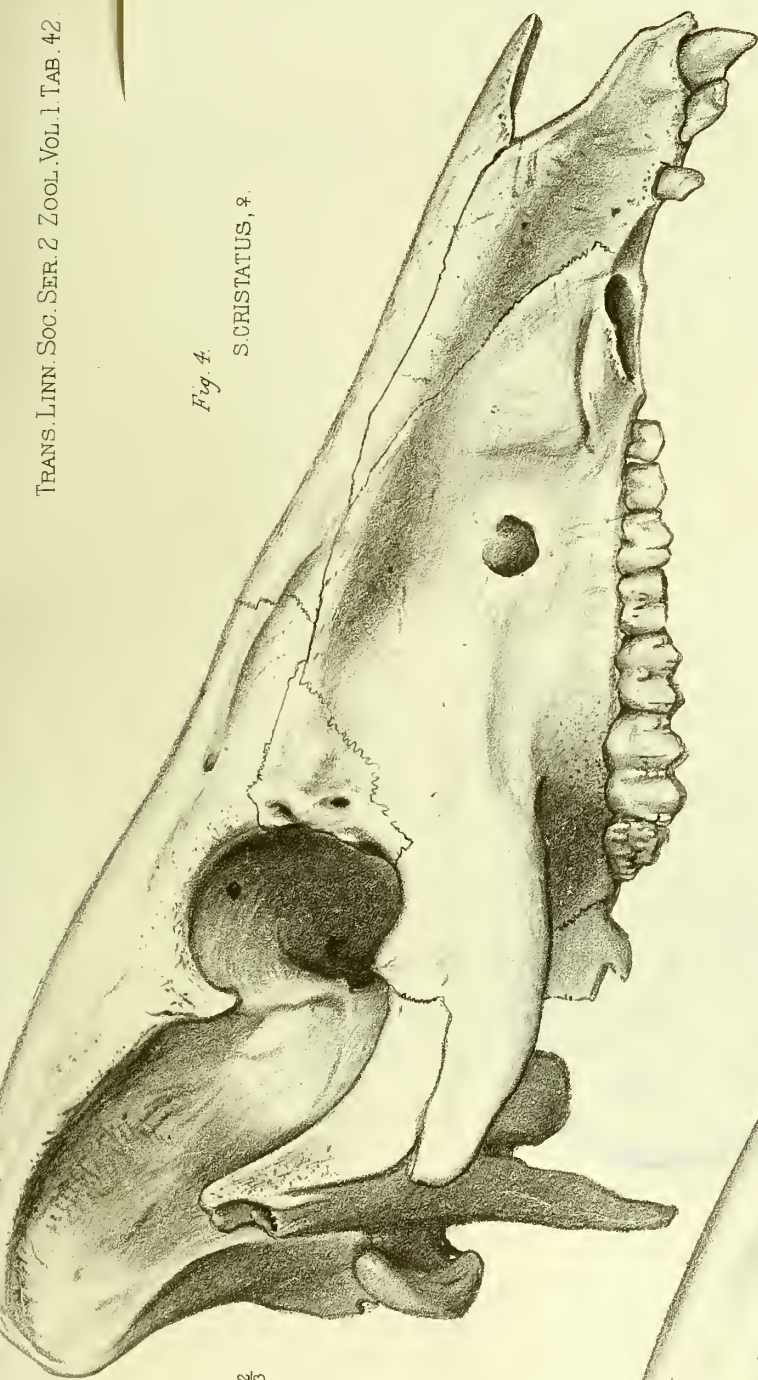


Fig. 4.
S. CRISTATUS, ♀.

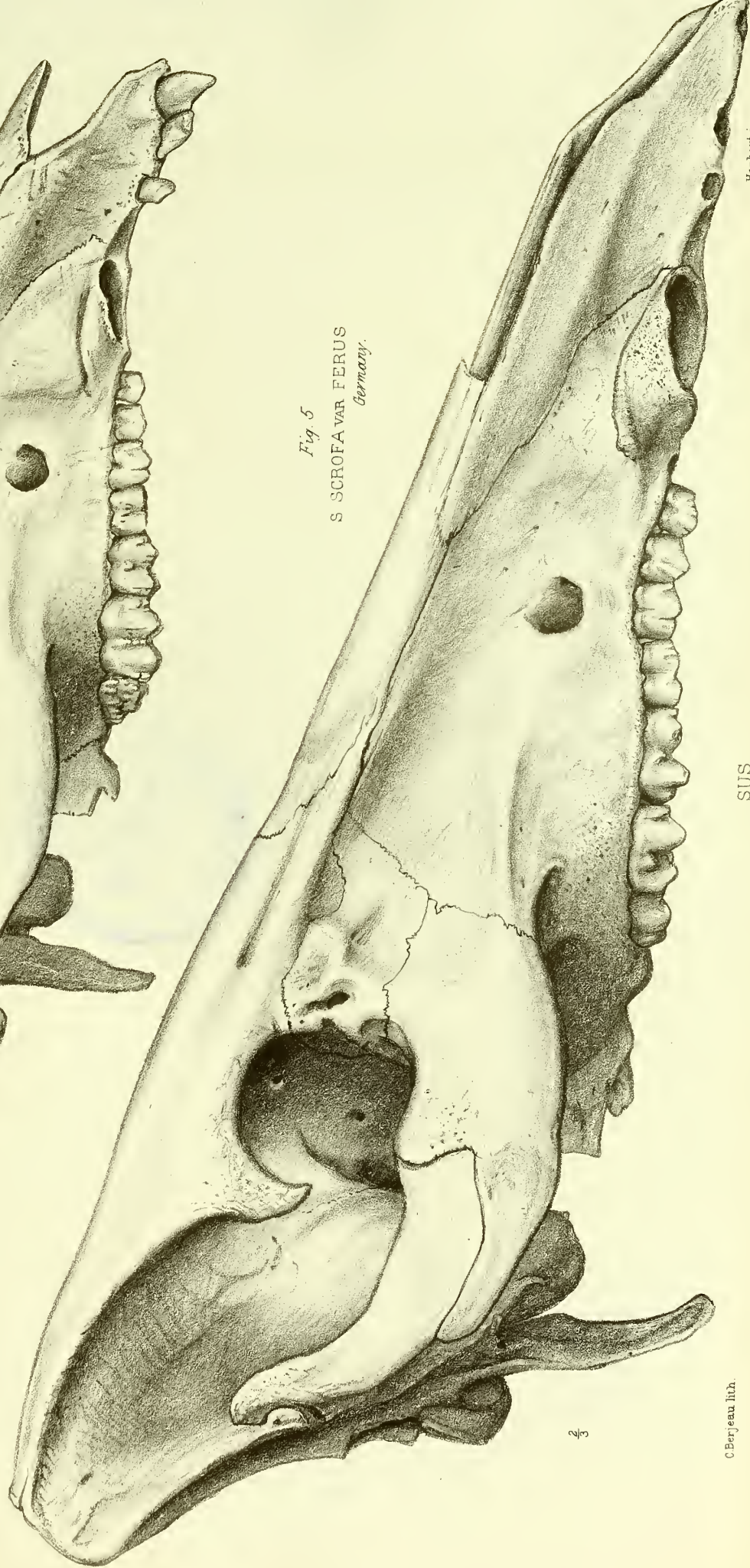


Fig. 5.
S. SCROFA VAR. FERUS
Germany.



Fig. 6.

S CRISTATUS. ♂

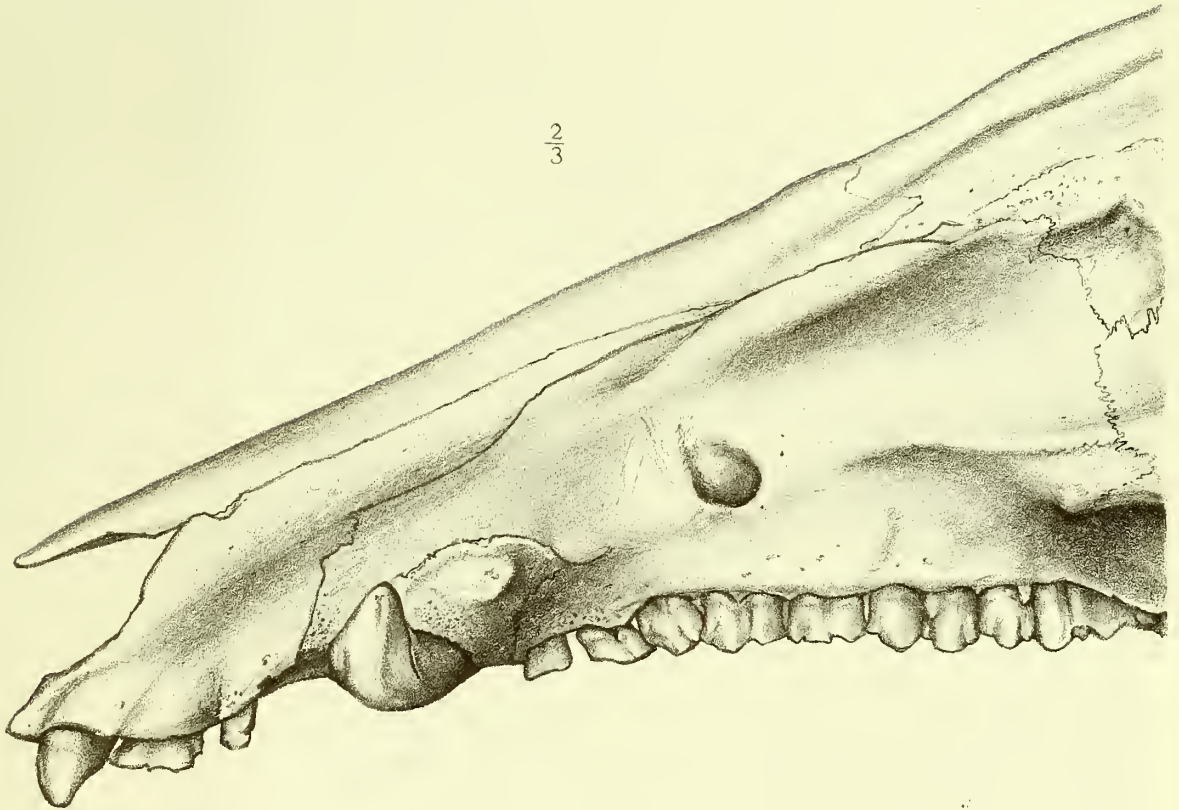


Fig. 7.

S. BARBATUS.

Borneo.

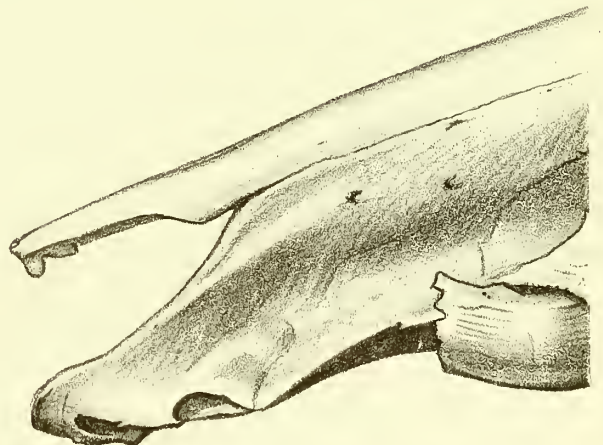




Fig. 6.

S. CRISTATUS ♂

$\frac{2}{3}$

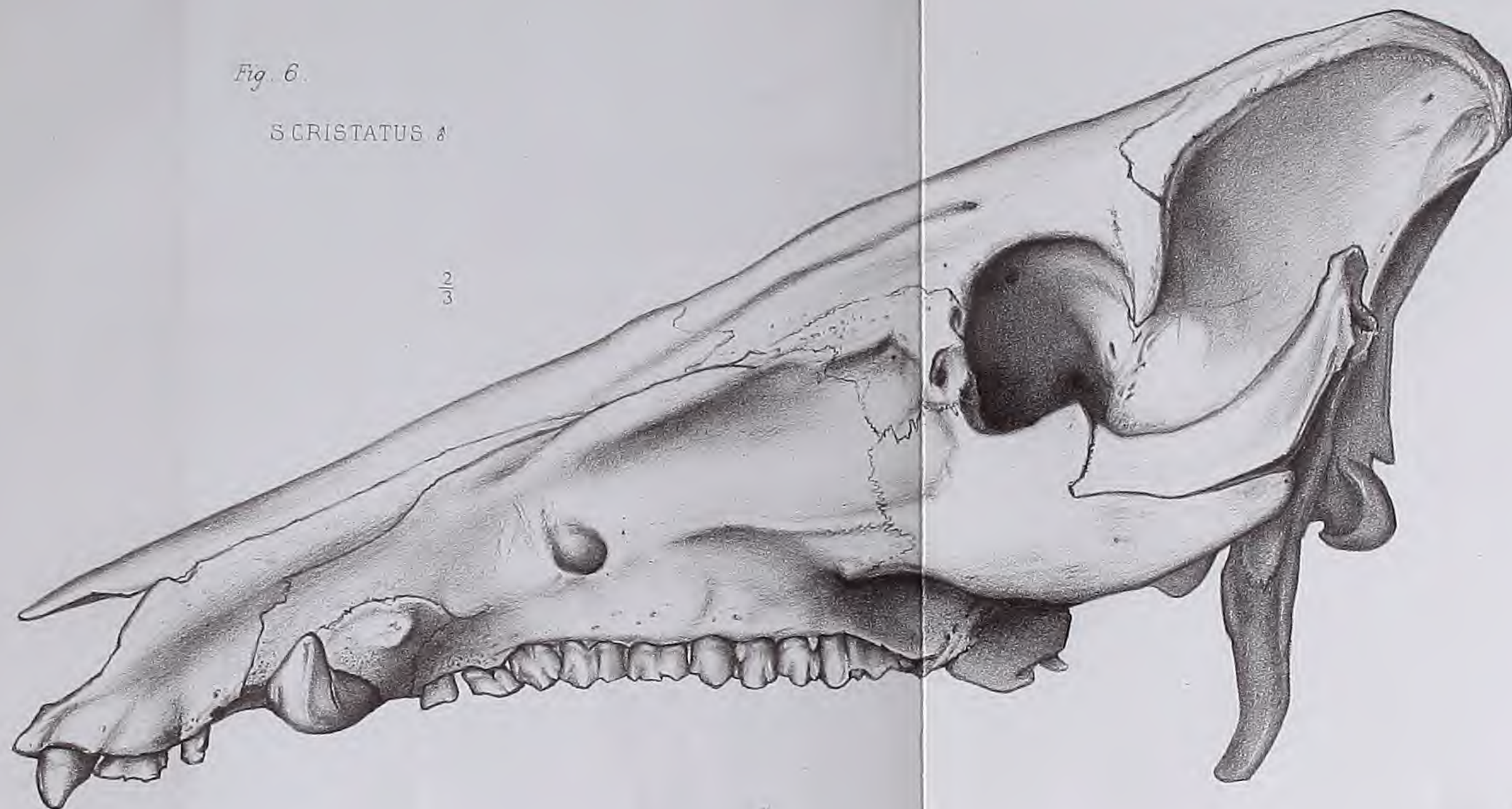
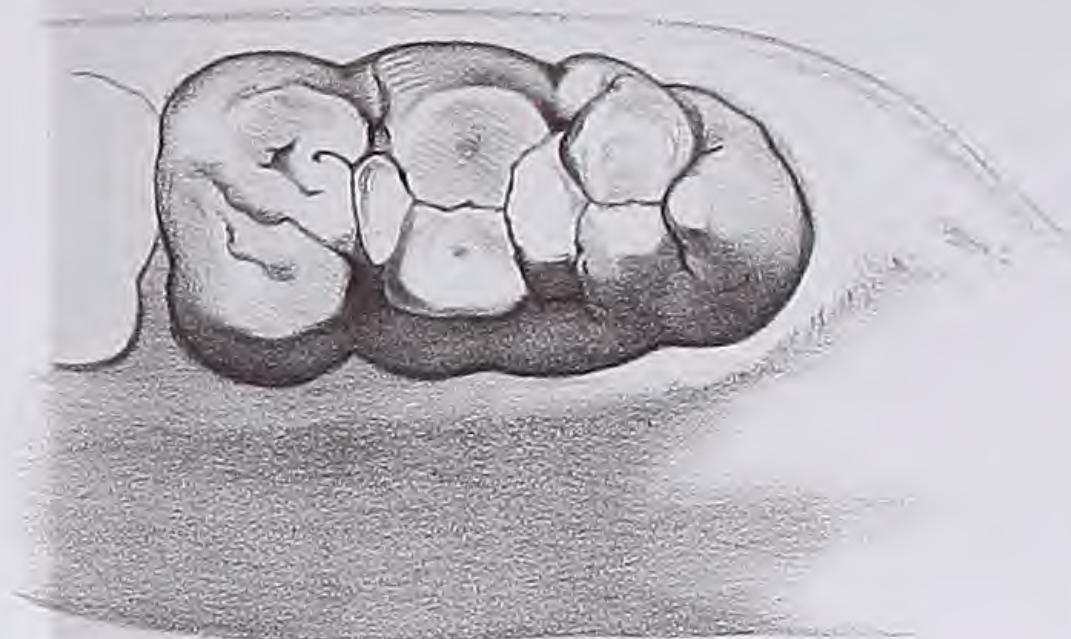
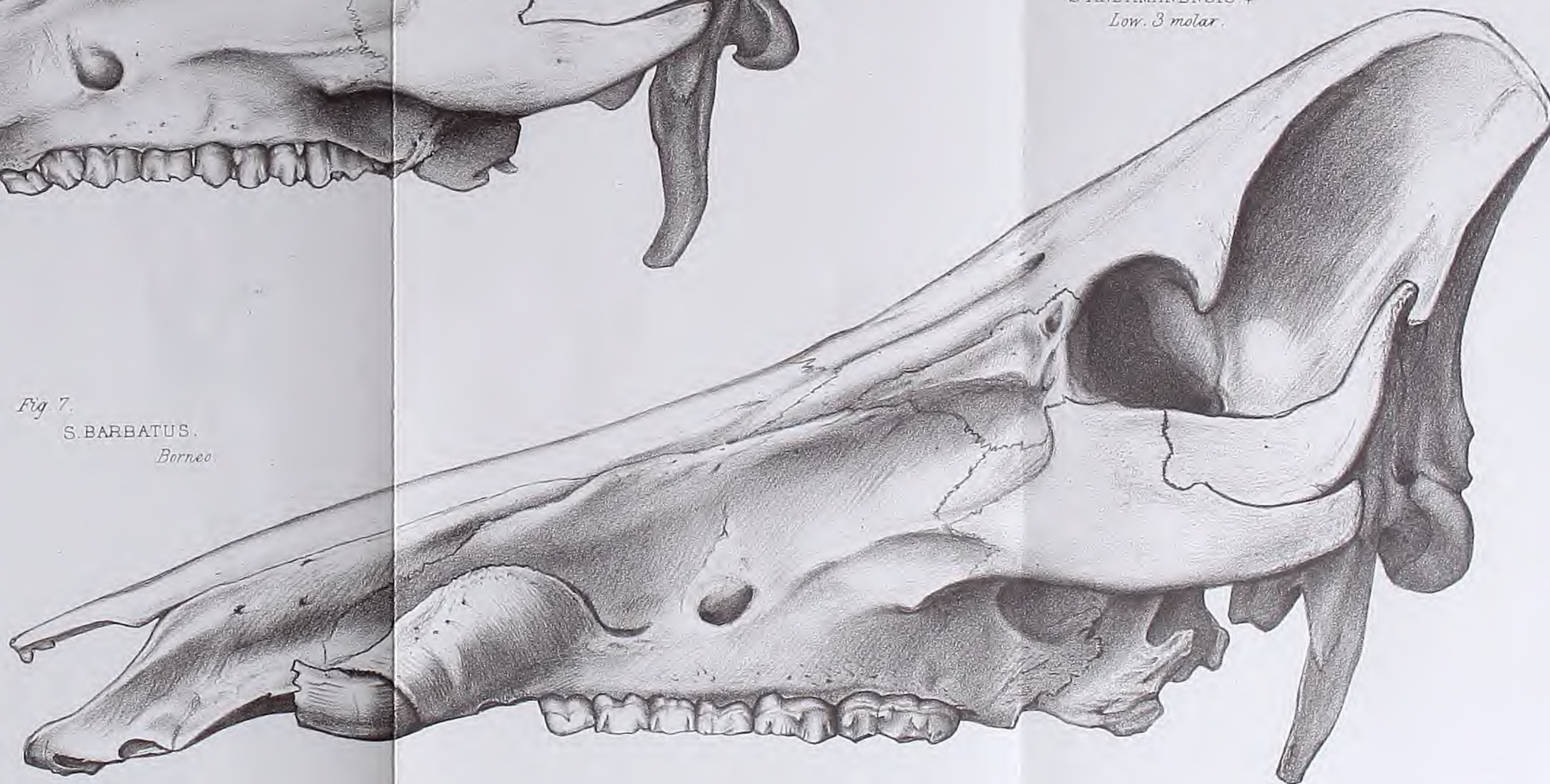


Fig. 7.

S. BARBATUS.
Borneo

$\frac{2}{3}$



$\frac{2}{12}$

Fig. 8.

S. ANDAMANENSIS ♀
Low. 3 molar.

